United States Department of Agriculture

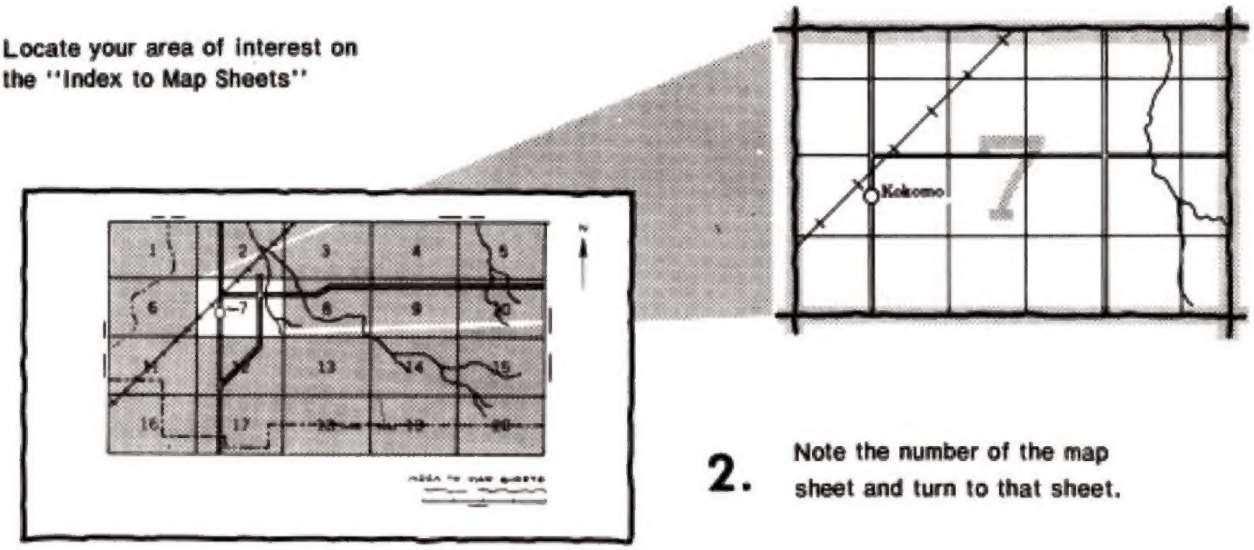
Soil Conservation Service

In cooperation with United States Department of the Interior, Bureau of Land Management, and New Mexico Agricultural Experiment Station

Soil Survey of De Baca County New Mexico

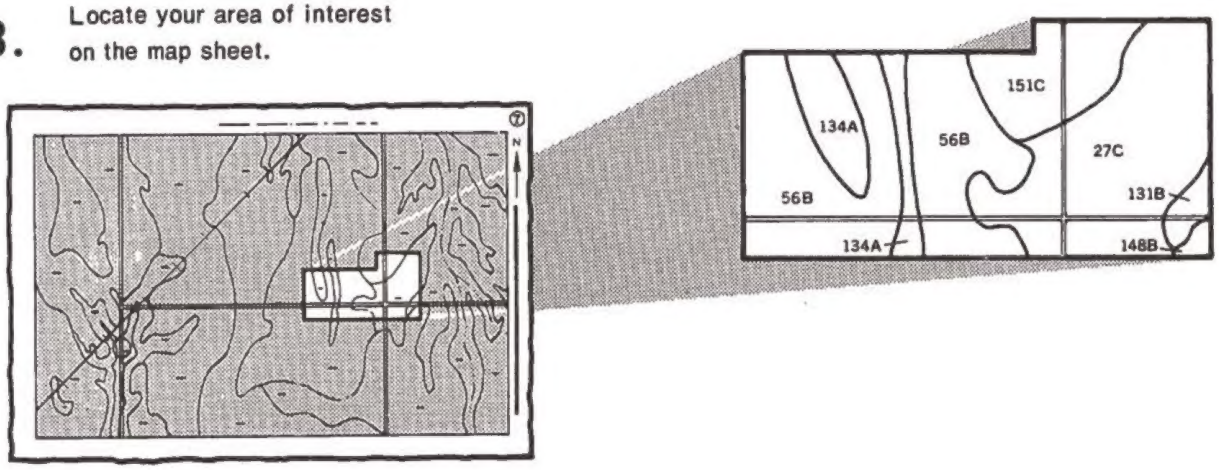
HOW TO USE

1. Locate your area of interest on the "Index to Map Sheets"

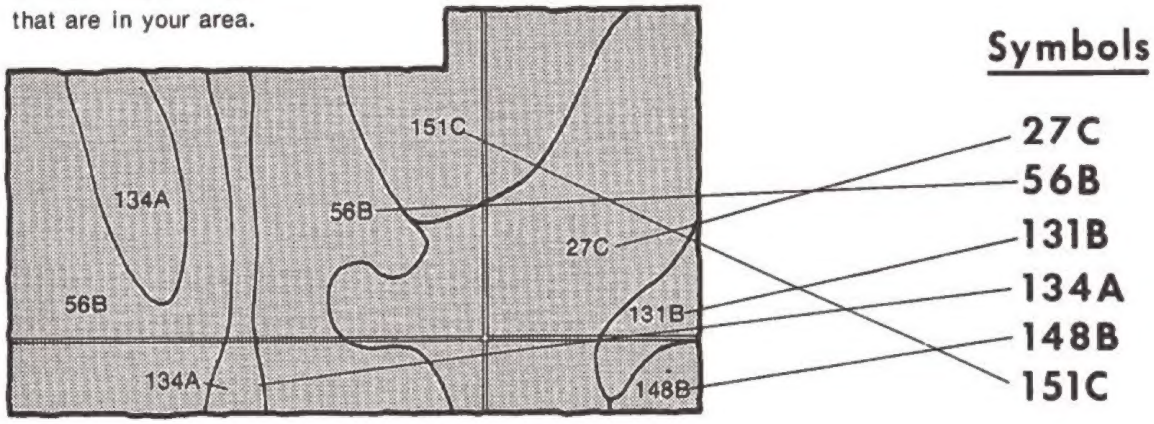


2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.

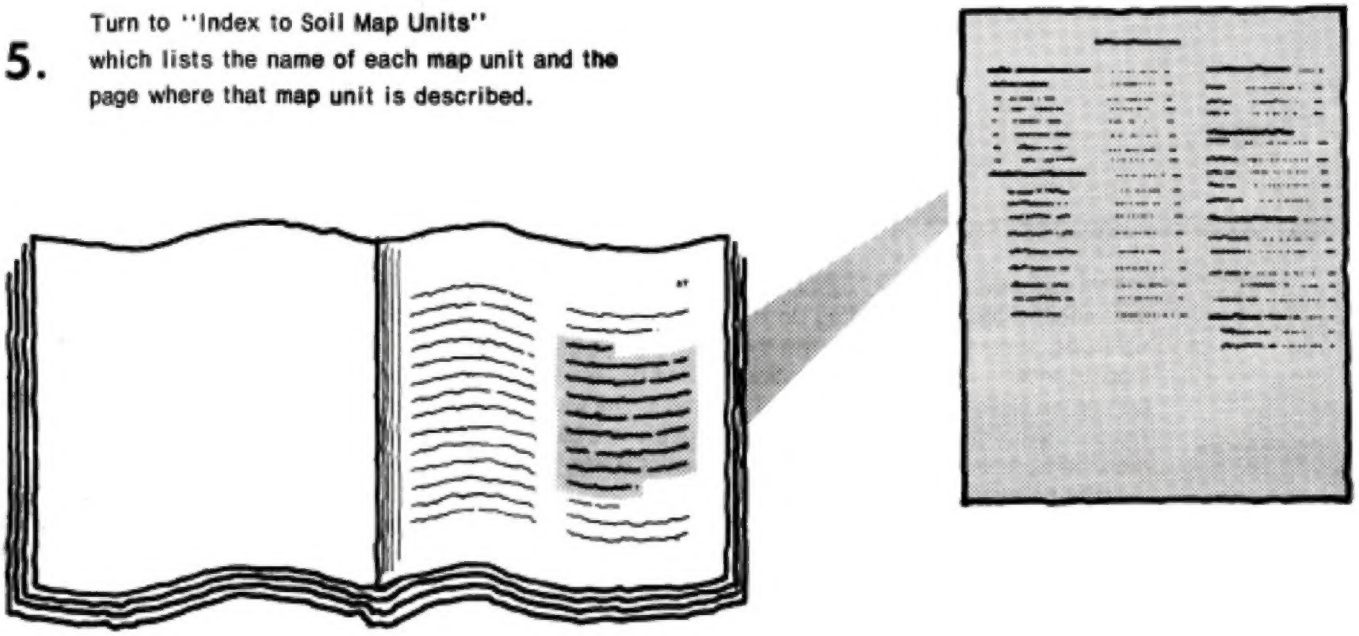


4. List the map unit symbols that are in your area.

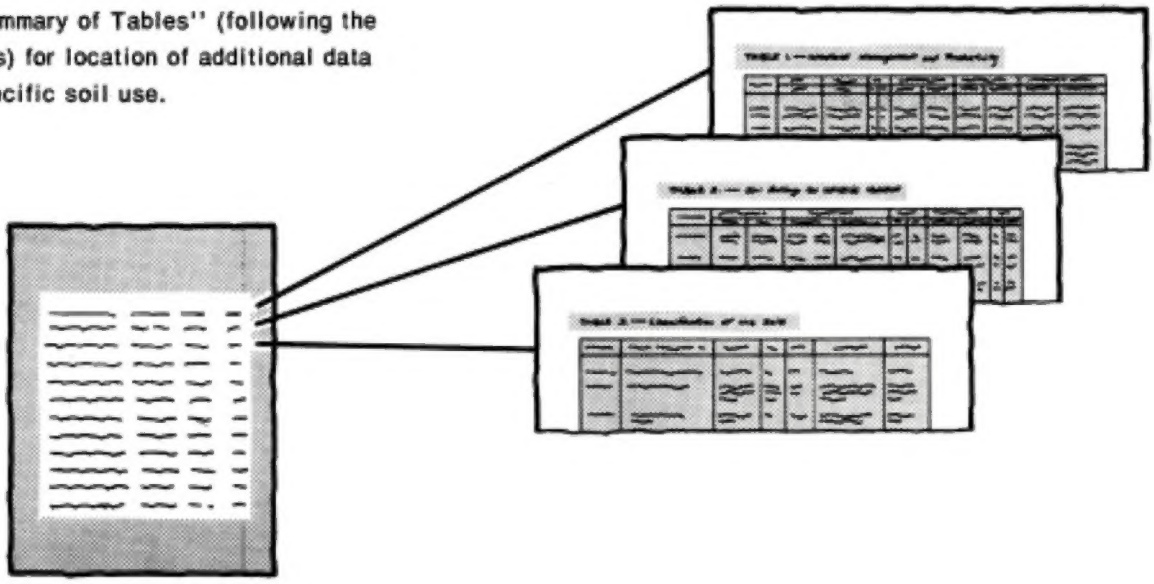


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in 1982. Soil names and descriptions were approved in 1983. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1982. This survey was made cooperatively by the Soil Conservation Service, the Bureau of Land Management, and the New Mexico Agricultural Experiment Station. It is part of the technical assistance furnished to the De Baca Soil and Water Conservation District.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: Typical area of Tucumcari-Redona association, 0 to 3 percent slopes, in foreground, and typical area of Latom-Rock outcrop complex, 3 to 20 percent slopes, in background.

Contents

Taxonomic units

Issued June 1986

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Summary of Tables

Foreword

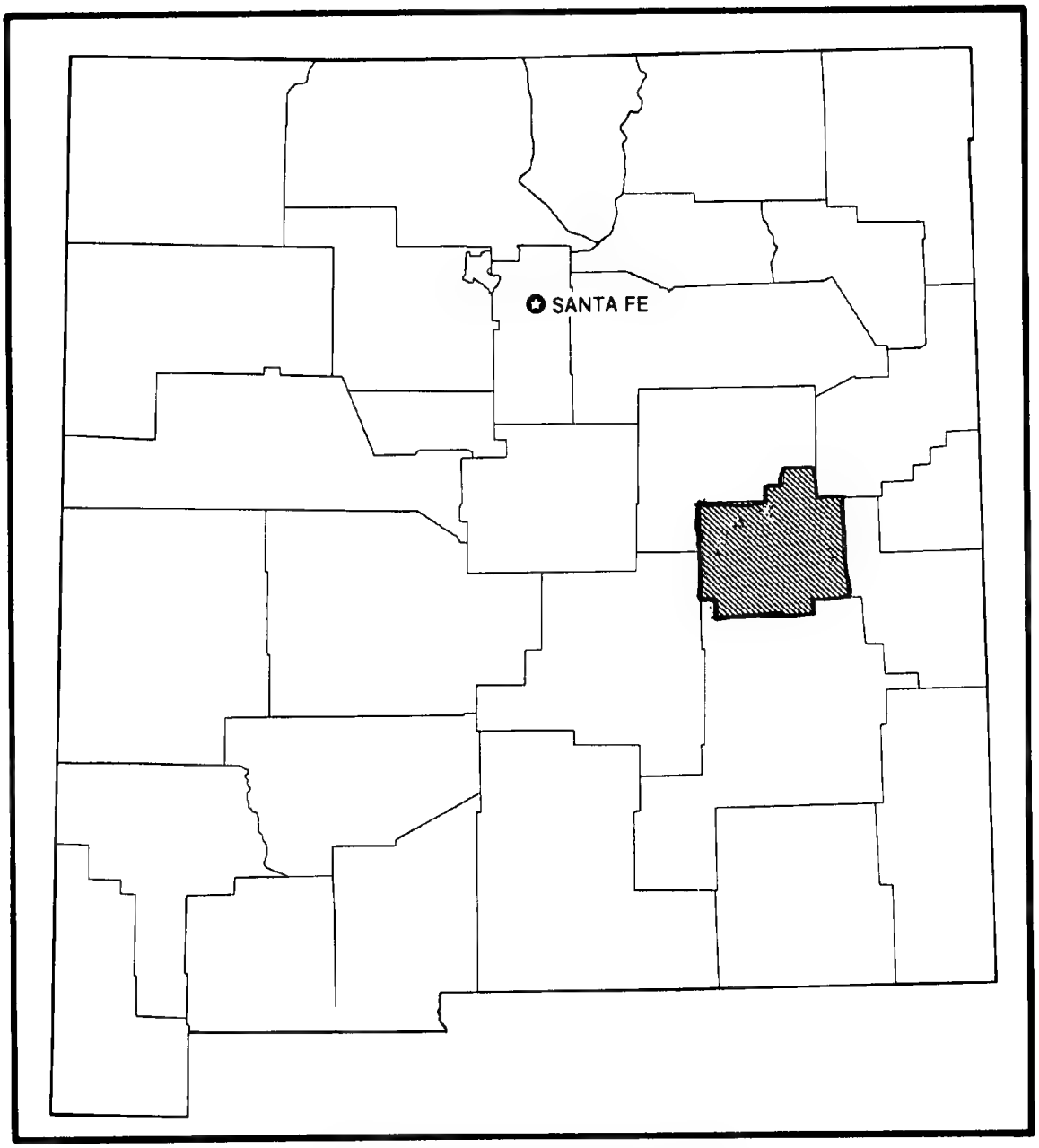
This soil survey contains information that can be used in land-planning programs in De Baca County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Ray T. Margo, Jr.
State Conservationist
Soil Conservation Service



Location of De Baca County in New Mexico.

Soil Survey of
De Baca County, New Mexico

By Robert A. Hill, Soil Conservation Service

Fieldwork by Robert A. Hill, David L. Carter, Tom E. McCarty
Rodney C. Perkins, and Barrie L. Wolf, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service
In cooperation with
United States Department of the Interior, Bureau of Land Management, and
New Mexico Agricultural Experiment Station

DE BACA COUNTY is in the east-central part of New Mexico. It has a total area of 1,509,120 acres, or 2,366 square miles. Fort Sumner, the largest town in the survey area, is the county seat. The population of the county in 1980 was 2,454.

Most of the survey area is in the western part of the Great Plains, but part is in the adjacent hills. A few small areas of the High Plains occur as high mesas and buttes in the northeastern part of the survey area. A large area of sandy plains is in the remaining eastern parts of the survey area and to the east of Fort Sumner. The elevation generally increases from 3,800 feet from the Pecos River to 4,400 feet at the eastern boundary of the county.

The area west of the Pecos River can be divided by the large east-west trending mesas to the north and the bedrock-controlled uplands to the south. The terrain rises gradually from the Pecos River to the west and northwest, attaining an elevation of 5,400 feet in the northwestern corner of the survey area.

Except for small areas on the High Plains in the northeastern part of the survey area, essentially all surface runoff enters the Pecos River drainage system. A number of intermittent tributary drainageways enter the Pecos River from the west, and a few relatively small ones enter from the east.

The soil maps for this survey area were prepared at two different levels of detail. The low-detail maps cover the rangeland of the survey area. The high-detail maps cover about 24,500 acres and can be used to make interpretations for intensive uses of the soils, such as irrigated farming and urban development.

An older survey, "Soil Survey of Fort Sumner Area," was published in 1930 (*6*). This earlier survey covers a part of the present survey. The present survey, however, updates the earlier survey and provides additional information and larger maps that show the soils in greater detail.

Descriptions, names, and delineations of soils in this soil survey do not fully agree with those on soil maps for adjacent survey areas. Differences are the result of better knowledge of soils, modifications in series concepts, intensity of mapping, or the extent of soils within the survey.

General Nature of the Survey Area

This section discusses the history and climate of the survey area.

History

The earliest inhabitants of De Baca County were nomadic Indian tribes. Francisco Vasquez de Coronado, in 1541, was probably the first European visitor to the county as he passed through with his expedition.

In 1862, the U.S. Army established the original Fort Sumner about 5 miles south of the present town. The fort was established as a reservation to guard Navajo Indians.

After the Atchison, Topeka, and Santa Fe Railway was completed in the county in 1908, numerous homesteaders moved in. Many small towns were established. In 1917, De Baca County was formed from parts of Chaves, Roosevelt, and Guadalupe Counties.

Agriculture is the primary source of income in the survey area. Farming is concentrated in areas south of Fort Sumner, along the Pecos River, and in scattered sprinkler-irrigated areas on the uplands. Cattle and sheep operations are the main enterprises in the rest of the survey area.

Climate

By Frank Houghton, climatologist for New Mexico, National Weather Service.

De Baca County is characterized by a semi-arid, continental climate. The average annual precipitation ranges from 10 to 16 inches. The rainy season frequently starts in May, when storms from the northwest move southward across the northeastern part of New Mexico. In summer heavier rains are received from the clockwise circulation of moist air from over the Gulf of Mexico, around the Bermuda high-pressure area that is displaced westward. Convection in the high temperature is aided by the gradual upslope flow of moist air from the southeast to result in brief, but often heavy, showers and thunderstorms. Hail sometimes accompanies the more severe showers. Eighty percent of the average annual precipitation falls in May through October, and more than 50 percent falls in July through September. Small tornadoes have been reported, but they have caused little damage.

Moisture from Pacific Ocean storms is the main source of precipitation in winter. These storms move eastward, losing much of their moisture over the mountains west of New Mexico. Light precipitation generally occurs when they reach the eastern part of New Mexico. Precipitation averages less than one-half inch per month in winter. An average of 3 days a month in the rainy season and 1 day a month in the dry season have 0.10 inch or more of precipitation. An average of 6 days a year have 0.50 inch or more of precipitation.

There is a wide variation in the amount of precipitation received from year to year and from month to month. The total annual precipitation received at Fort Sumner was 41.37 inches in 1941 and 4.45 inches in 1956, and more than 12 inches of rain fell at Alamogordo Dam in September, 1941, compared with no rain in September, 1956. Five miles south of Fort Sumner, 7.28 inches of rain fell on September 16, 1970. Patterns of precipitation and temperature for Fort Sumner are shown in table 1, and these patterns are generally represer other parts of the county.

Average annual snowfall ranges from 4 to 15 inches. This usually falls only a few inches at a time, and seldom remains on the ground for more than a day or two. Moderate winds may accompany the snow and cause some drifting.

Characteristics of a continental-type climate include large diurnal and annual temperature ranges, low relative humidity, and plentiful sunshine. The diurnal range in temperature in the county averages more than 30 degrees F. The highest temperature recorded was 110 degrees at Dunlap on July 14, 1958, and June 27, 1957, and the lowest temperature was -27 degrees at Fort Sumner on January 13, 1963. Mean annual temperatures range from 55 degrees in the western part of the county to 60 degrees in the south-central part. Summers are moderately hot. Freezing temperatures occur on an average of 100 days a year, mostly from mid-November through mid-March; a day or two may have below-zero temperatures. Only on a few days in winter does the temperature fail to rise above freezing. The average freeze-free season is about 6 months, from mid-April to late in October.

On the average the sun shines an estimated 3,300 hours a year, or 75 percent of the possible time. Annual evaporation at Alamogordo Dam averages 109 inches, two-thirds of which occurs during May through October. Average annual relative humidity ranges from 75 percent in the cool morning hours to 35 percent in the heat of the day. Relative humidity is generally a little lower in spring and a little higher in winter. Average annual windspeed is approximately 12 miles per hour. The winds are strongest late in winter and in spring. Winds during this time may be more than 25 miles per hour and persist for several hours, blowing dust during the drier periods. The dominant wind direction is southerly most of the year, but it becomes more westerly in winter.

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biologic activity.

The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind or segment of the landscape. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept or model of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with considerable accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Individual soils on the landscape commonly merge gradually onto one another as their characteristics gradually change. To construct an accurate map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted color, texture, size, and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While the soil survey was in progress, samples of some of the soils in the area were collected for laboratory analyses and for engineering tests. Soil scientists interpreted the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils were field tested through observation of the soils in different uses and under different levels of management. Some interpretations were modified to fit local conditions, and some new interpretations were developed to meet local needs. Data were assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management were assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can state with a fairly high degree of probability that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

General Soil Map Units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The soils or miscellaneous areas making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils or miscellaneous areas can be identified on the map. Likewise, areas that are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The general soil map of this survey area does not join, in all instances, with the general soil maps of adjacent soil survey areas. This is the result of different scales of mapping, differences in soil patterns on the landscape, and advances in soil classification.

The general map units in this survey have been grouped into general kinds of landscape for broad interpretive purposes. Each of the broad groups and the map units in each group are described in the following pages.

Map Unit Descriptions

1. Sharvana-Slaughter-Friona

Shallow and moderately deep, nearly level to gently sloping, well drained soils; on ridges and mesas and in swales

This map unit is in the northeastern corner of the survey area. It is mainly in nearly level to gently sloping areas on ridges and mesas and in swales. Slope is 0 to 3 percent. The vegetation is mainly warm- and cool-season short grasses. Elevation is 4,400 to 5,000 feet. The average annual precipitation is 14 to 16 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

This unit makes up about 3 percent of the survey area. It is about 39 percent Sharvana and similar soils, 21 percent Slaughter and similar soils, and 20 percent Friona and similar soils. The remaining 20 percent is components of minor extent.

Sharvana soils are on ridges. These soils are shallow and well drained. They formed in alluvium. The surface layer is brown fine sandy loam. The subsoil is reddish brown fine sandy loam. Indurated caliche is at a depth of 13 inches.

Slaughter soils are in swales. These soils are shallow and well drained. They formed in alluvium. The surface layer is reddish brown sandy clay loam. The subsoil is reddish brown clay loam. Indurated caliche is at a depth of 17 inches.

Friona soils are on mesas. These soils are moderately deep and well drained. They formed in alluvium. The surface layer and subsoil are reddish brown sandy clay loam. Indurated caliche is at a depth of 26 inches.

Of minor extent in this unit are Berwolf soils.

Most areas of this unit are used for livestock grazing. A few areas are used for wildlife habitat and nonirrigated crops, mainly small grain. Soil blowing and shallow depth to indurated caliche are the main limitations.

This unit furnishes habitat of sparse short grasses interspersed with sparse stands of shrubs. The habitat supports fair to good populations of antelope, coyote, and black-tailed jackrabbit. Rodent populations are present in fair abundance and are hunted by raptors. The long-billed curlew uses this unit during migration.

2. Pastura-Darvey-Clovis

Very shallow, shallow, and deep, nearly level to strongly sloping, well drained soils; on uplands and in valleys

This map unit is on the west side of the survey area. It is mainly in nearly level to strongly sloping areas on uplands and in valleys. Slope is 0 to 15 percent. The vegetation is mainly cool- and warm-season short grasses with sparse trees in the sandy areas. Elevation is 4,700 to 5,400 feet. The average annual precipitation is 12 to 14 inches, the average annual air temperature is 55 to 57 degrees F, and the average frost-free period is 160 to 180 days.

This unit makes up about 7 percent of the survey area. It is about 32 percent Pastura soils, 30 percent Darvey soils, and 17 percent Clovis and similar soils. The remaining 21 percent is components of minor extent.

Pastura soils are on mesas, knobs, and ridges. These soils are very shallow and shallow and are well drained. They formed in alluvium. The soils are light brownish gray loam throughout. Indurated caliche is at a depth of 15 inches.

Darvey soils are on uplands. These soils are deep and well drained. They formed in alluvium. The surface layer is brown loam. The subsoil is brown and light brown loam. Below this to a depth of 60 inches or more the soils are pink and pinkish white, calcareous clay loam.

Clovis soils are in broad valleys. These soils are deep and well drained. They formed in loamy material. The surface layer is brown loam. The subsoil is brown and reddish brown clay loam. Below this to a depth of 60 inches or more the soils are pink, calcareous loam.

Of minor extent in this unit are Deama and Cardenas soils.

This unit is used mainly for livestock grazing. It is also used for wildlife habitat. Soil blowing and shallow depth to indurated caliche are the main limitations.

This unit furnishes habitat of extensive short-grass prairie. It supports fair to good populations of antelope, coyote, black-tailed jackrabbit, and scaled quail.

3. Kolar-Pojo-Neso

Very shallow, shallow, and moderately deep, nearly level to gently sloping, well drained soils; on mesas

This map unit is mainly west of Fort Sumner, but there are small areas in the southeastern part of the survey area. It is on mesas. Slope is 0 to 5 percent. The vegetation on the very shallow and shallow soils is mainly cool- and warm-season short grasses. The deeper soils support tall warm-season grasses interspersed with thick shrubs and brush. Elevation is 3,900 to 5,200 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

This unit makes up about 17 percent of the survey area. It is about 33 percent Kolar soils, 26 percent Pojo soils, and 25 percent Neso soils. The remaining 16 percent is components of minor extent.

Kolar soils are on mesas. These soils are very shallow and shallow and are well drained. They formed in alluvium. The surface layer is brown very fine sandy loam. The upper part of the subsoil is brown very fine sandy loam, and the lower part is light brown gravelly very fine sandy loam. Indurated caliche is at a depth of 18 inches.

Pojo soils are in slightly concave areas on mesas. These soils are moderately deep and well drained. They formed in alluvial and eolian material. The surface layer is reddish brown loamy fine sand. The subsoil is reddish brown fine sandy loam. Indurated caliche is at a depth of 25 inches.

Neso soils are on ridges and knobs of mesas. These soils are very shallow and shallow and are well drained. They formed in alluvium. The surface layer is brown very gravelly fine sandy loam. The underlying material is light brown very cobbly fine sandy loam. Indurated caliche is at a depth of 12 inches.

Of minor extent in this unit are areas of the Chispa soils.

This unit is used mainly for livestock grazing. It is also used for wildlife habitat. Soil blowing and very shallow and shallow depth to indurated caliche are the main limitations.

This unit furnishes habitat of short grasses interspersed with snakeweed and yucca. The habitat supports fair to good populations of antelope, coyote, badger, raven, and box turtle. Playas provide important habitat in wet years.

4. Ustifluvents-Ima

Deep, nearly level to gently sloping, well drained soils; mainly on flood plains and alluvial terraces

This map unit is along the Pecos River and some of its tributaries. It is mainly on flood plains and alluvial terraces. Slope is 0 to 3 percent. The vegetation on this unit is mainly warm-season grasses interspersed with thick brush and very scattered trees. Elevation is 3,700 to 4,800 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

This unit makes up about 3 percent of the survey area. It is about 60 percent Ustifluvents and similar soils and 15 percent Ima and similar soils. The remaining 25 percent is components of minor extent.

Ustifluvents are on flood plains and alluvial terraces. These soils are deep and well drained. They formed in alluvium. The surface layer is reddish brown fine sandy loam. The underlying layer is stratified, light reddish brown gravelly loamy coarse sand and clay loam to a depth of 60 inches or more.

Ima soils are on alluvial terraces and hillsides. These soils are deep and well drained. They formed in alluvium. The surface layer and subsoil are reddish brown fine sandy loam. Below this to a depth of 60 inches or more is light reddish brown sandy loam.

Of minor extent in this unit are Montoya and La Lande soils.

This unit is used mainly for livestock grazing. It is also used as irrigated cropland and for wildlife habitat. Major crops include alfalfa, pasture, sorghum, and small grain. The hazard of soil blowing and limited available water capacity are the main limitations.

This unit furnishes a highly diverse assemblage of habitats. The aquatic environment of the Pecos River provides habitat for fish, beaver, and muskrat on a resident basis, and ducks, geese, sandhill crane, and many shore birds migrate along the river. The bordering riparian trees and shrubs furnish nesting, roosting, and

foraging habitat for owls, hawks, and songbirds. The complex of croplands and shrublands supports good populations of deer, bobwhite quail, scaled quail, ring-necked pheasant, skunk, and cottontail.

5. Berwolf-Roswell

Deep, nearly level to moderately steep, well drained soils; mainly on uplands

This map unit is immediately west of Fort Sumner, in the southeastern part of the survey area. It is mainly on uplands. Slope is 0 to 20 percent. The vegetation is mainly cool- and warm-season grasses interspersed with sparse brush and shrubs. Elevation is 3,700 to 4,800 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

This unit makes up about 12 percent of the survey area. It is about 70 percent Berwolf and similar soils and 15 percent Roswell and similar soils. The remaining 15 percent is components of minor extent.

Berwolf soils are on uplands. These soils are deep and well drained. They formed in alluvial and eolian material. The surface layer is brown fine sandy loam. The subsoil is reddish brown and yellowish red fine sandy loam. Below this to a depth of 60 inches or more the soils are reddish yellow and pink fine sandy loam.

Roswell soils are on dunes and in convex areas. These soils are deep and well drained. They formed in eolian material. The surface layer is brown fine sand. Below this to a depth of 60 inches or more is light reddish brown fine sand.

Of minor extent in this unit are Chispa, Redona, Armesa, Kolar, and Pojo soils.

This unit is used mainly for livestock grazing. It is also used for wildlife habitat. Soil blowing is the main limitation.

This unit furnishes habitat consisting of midgrasses and mesquite interspersed with areas of dunes. The habitat supports small numbers of prairie chicken. There are fair populations of mule deer, coyote, badger, kit fox, and black-tailed jackrabbit. Snakes and lizards are abundant. Duned areas provide habitat for many small rodents and their predators.

6. Chispa-Redona-Armesa

Deep, nearly level to strongly sloping, well drained soils; on uplands

This map unit is mainly on uplands north and south of Fort Sumner. Slope is 0 to 10 percent. The vegetation on this unit is mainly warm-season short grasses and scattered brush. Elevation is 3,800 to 5,000 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

This unit makes up about 15 percent of the survey area. It is about 37 percent Chispa soils, 25 percent Redona soils, and 15 percent Armesa and similar soils. The remaining 23 percent is components of minor extent.

Chispa soils are on uplands. These soils are deep and well drained. They formed in alluvium. The surface layer is brown fine sandy loam. The subsoil is brown to light brown sandy clay loam. Below this to a depth of 60 inches or more is light reddish brown sandy clay loam.

Redona soils are in broad valleys on uplands. These soils are deep and well drained. They formed in alluvium. The surface layer is reddish brown fine sandy loam. The subsoil is reddish brown and yellowish red sandy clay loam. Below this to a depth of 60 inches or more is pink sandy clay loam.

Armesa soils are on uplands. These soils are deep and well drained. They formed in alluvium. The surface layer is brown fine sandy loam. The subsoil is light reddish brown sandy clay loam. Below this to a depth of 60 inches or more is pink sandy clay loam.

Of minor extent in this unit are Berwolf and Ima soils.

This unit is used mainly for livestock grazing. It is also used for wildlife habitat and as irrigated cropland. Major crops are small grain, alfalfa, and seed crops. Soil blowing is the main limitation.

This unit furnishes habitat consisting of short-grass prairie and cropland. The prairie grasses support fair populations of antelope, coyote, kit fox, jackrabbit, and rodents. Wintering waterfowl graze on the irrigated fields.

7. Redona-Tucumcari-Armesa

Deep, nearly level to gently sloping, well drained soils; in broad valleys and on uplands and basin floors

This unit is around Red Lake, Urton Lake, and Whites Draw and along upper Yeso Creek. It is mainly in broad valleys and on basin floors and associated uplands. Slope is 0 to 5 percent. The vegetation is mainly short and tall, warm-season grasses with thick brush in some areas. Elevation is 3,800 to 5,000 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

This unit makes up about 6 percent of the survey area. It is about 33 percent Redona soils, 32 percent Tucumcari soils, and 15 percent Armesa and similar soils. The remaining 20 percent is components of minor extent.

Redona soils are in broad valleys and on uplands. These soils are deep and well drained. They formed in alluvium. The surface layer is reddish brown fine sandy loam. The subsoil is reddish brown and yellowish red sandy clay loam. Below this to a depth of 60 inches or more is pink sandy clay loam.

Tucumcari soils are in broad valleys and on basin floors. These soils are deep and well drained. They formed in alluvium. The surface layer is reddish brown

clay loam. The subsoil is reddish brown clay. Below this to a depth of 60 inches or more is reddish brown clay.

Armesa soils are on uplands. These soils are deep and well drained. They formed in alluvium. The surface layer is brown fine sandy loam. The subsoil is light reddish brown sandy clay loam. Below this to a depth of 60 inches or more is pink sandy clay loam.

Of minor extent in this unit are Hassell and Montoya soils.

This unit is used mainly for livestock grazing. It is also used for wildlife habitat. A very slow water intake rate, a clayey surface layer, and high shrink-swell potential are the main limitations.

This unit furnishes short-grass prairie habitat. It supports fair to good populations of antelope, jackrabbit, and scaled quail.

8. Gallen-Chispa-Ima

Deep, gently sloping to steep, well drained soils; on alluvial terraces, hillsides, and breaks

This map unit is adjacent to the Pecos River and south of Yeso Creek, along the breaks. It is mainly on terraces and hillsides. Slope is 1 to 35 percent. The vegetation is mainly cool- and warm-season grasses interspersed with scattered trees in the steeper areas and brush in the areas of deeper soil. Elevation is 4,000 to 5,000 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

This unit makes up about 5 percent of the survey area. It is about 44 percent Gallen soils, 20 percent Chispa soils, and 20 percent Ima soils. The remaining 16 percent is components of minor extent.

Gallen soils are on uplands. These soils are deep and well drained. They formed in gravelly material. The surface layer is reddish brown gravelly sandy loam. The subsoil is reddish brown very gravelly sandy loam. Below this to a depth of 60 inches or more is light reddish brown extremely gravelly sandy loam.

Chispa soils are on uplands. These soils are deep and well drained. They formed in alluvium. The surface layer is brown fine sandy loam. The subsoil is brown and light brown sandy clay loam. Below this to a depth of 60 inches or more is light reddish brown sandy clay loam.

Ima soils are on hillsides and alluvial terraces. These soils are deep and well drained. They formed in alluvium. The surface layer and subsoil are reddish brown fine sandy loam. Below this to a depth of 60 inches or more is light reddish brown sandy loam.

Of minor extent in this unit are Torriorthents.

This unit is used mainly for livestock grazing. It is also used for wildlife habitat. The hazards of soil blowing and water erosion and steepness of slope are the main limitations.

This unit provides mainly habitat of short-grass prairie interspersed with rocky breaks, but there are some trees and shrubs. The habitat supports fair populations of mule deer, coyote, bobcat, pack rat, rock squirrel, and raptors.

9. Regnier-Latom-Rock outcrop

Very shallow and shallow, nearly level to very steep, well drained soils, and Rock outcrop; on breaks, hillsides, and ridges

This map unit is throughout the survey area. It is mainly on the breaks and hillsides. Slope is 0 to 80 percent. The vegetation is mainly cool- and warm-season grasses interspersed with scattered shrubs, brush, and trees. Elevation is 3,800 to 5,200 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

This unit makes up about 12 percent of the survey area. It is about 30 percent Regnier and similar soils, 20 percent Latom and similar soils, and 17 percent Rock outcrop. The remaining 33 percent is components of minor extent.

Regnier soils are on hillsides. These soils are shallow and well drained. They formed in residuum derived dominantly from shale. The surface layer is reddish brown clay loam. Partially consolidated shale is at a depth of 18 inches.

Latom soils are on hillsides and ridges. These soils are very shallow and shallow and are well drained. They formed in residuum derived dominantly from sandstone. The surface layer is pale brown fine sandy loam. Sandstone is at a depth of 7 inches.

Rock outcrop consists of areas of exposed sandstone or shale on breaks and ledges. In some areas large boulders are present just below steep outcrops.

Of minor extent in this unit are Los Tanos and Chispa soils.

This unit is used mainly for livestock grazing. It is also used for wildlife habitat. Shallow and very shallow soil depth, steepness of slope, and a hazard of water erosion are the main limitations.

This extensive unit provides diverse habitat that is along drainageways and in areas of rough, broken land. It consists of juniper- and shrub-dominated habitat that is important to herds of mule deer. Larger predators, such as mountain lion and black bear, are occasionally observed. Many raptors and songbirds nest in the trees and shrubs and on the ledges.

The riparian tree and shrub communities along Salado Creek, Yeso Arroyo, and other major arroyos provide important nesting, foraging, and escape cover.

10. Holloman-Reeves-Poquita

Very shallow to deep, nearly level to steep, well drained soils; on uplands and alluvial flats

This map unit is in the southern part of the survey area, near Dunlap and along Yeso Arroyo and Salado

Creek. It is mainly on uplands and associated flats and side slopes. Slope is 0 to 35 percent. The vegetation is mainly warm-season grasses with scattered shrubs, brush, and a few trees in the steeper areas. Elevation is 3,800 to 5,200 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

This unit makes up about 20 percent of the survey area. It is about 35 percent Holloman soils, 22 percent Reeves soils, and 19 percent Poquita soils. The remaining 24 percent is components of minor extent.

Holloman soils are on uplands. These soils are very shallow and shallow and are well drained. They formed in residuum derived dominantly from gypsum. The surface layer is yellowish brown and light gray loam. Gypsum is at a depth of 13 inches.

Reeves soils are on uplands and in concave areas. These soils are moderately deep to gypsum and are well drained. They formed in gypsiferous alluvium. The surface layer is brown loam. The subsoil is light brown loam. Gypsum is at a depth of 35 inches.

Poquita soils are on alluvial flats and toe slopes. These soils are deep and well drained. They formed in alluvium derived dominantly from shale. The surface layer is brown very fine sandy loam. The subsoil is yellowish red loam. Below this to a depth of 60 inches or more is pink loam.

Of minor extent in this unit are Lozier and San Jon soils and Rock outcrop.

This unit is used mainly for livestock grazing. It is also used for wildlife habitat. Steepness of slope, the hazards of soil blowing and water erosion, and shallow and very shallow soil depth are the main limitations.

This extensive unit provides habitat of short-grass prairie with abundant mesquite and yucca. It supports large populations of antelope and black-tailed jackrabbit. Scaled quail populations are highest where the stands of mesquite are thickest. Large numbers of small rodents are present, and they are hunted by hawks and eagles.

Detailed Soil Map Units

The map units delineated on the detailed maps at the back of this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit is given under "Use and Management of the Soils."

A map unit delineation on a map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils or miscellaneous areas. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some "included" areas that belong to other taxonomic classes.

Most included soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, inclusions. They may or may not be mentioned in the map unit description. Other included soils and miscellaneous areas, however, have properties and behavior divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of included areas in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but if intensive use of small areas is planned, onsite investigation to precisely define and locate the soils and miscellaneous areas is needed.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying layers, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying layers. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Berwolf loamy fine sand, 0 to 5 percent slopes, is one of several phases in the Berwolf series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes or associations.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Tucumcari-Montoya clay loams, 0 to 3 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary

to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Ima-Armesa association, 1 to 10 percent slopes, is an example.

This survey includes *miscellaneous areas.* Such areas have little or no soil material and support little or no vegetation. Gravel pits is an example.

This survey was mapped at two levels of detail. At the most detailed level, map units are narrowly defined. This means that map unit boundaries were plotted and verified at closely spaced intervals. At the less detailed level, map units are broadly defined. Boundaries were plotted and verified at wider intervals. In the map legend, narrowly defined units are indicated by a three-digit number and broadly defined units, are indicated by a two-digit number.

The detailed soil maps in this soil survey do not in every case join those of older, adjoining soil surveys. This is the result of different scales of mapping, differences of soil patterns over the landscape, and advances in soil classification.

Table 2 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

Map Unit Descriptions

12—Ima-Armesa association, 1 to 10 percent slopes. This map unit is on uplands. Areas are elongated in shape and are 100 to 500 acres in size. The native vegetation is mainly short grasses. Elevation is 3,800 to 4,800 feet. The average annual precipitation is about 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

This unit is 50 percent Ima fine sandy loam, 1 to 5 percent slopes, and 25 percent Armesa fine sandy loam, 1 to 10 percent slopes. The Ima soil is on hillslopes and terraces, and the Armesa soil is on knobs, ridges, and short escarpments.

Included in this unit are small areas of Kolar soils on ridges, Redona soils in swales, and Minneosa soils on alluvial terraces. Included areas make up about 25 percent of the total acreage.

The Ima soil is deep and well drained. It formed in alluvium derived dominantly from sandstone and shale. Typically, the surface layer is brown fine sandy loam about 7 inches thick. The subsoil is brown fine sandy loam about 23 inches thick. The substratum to a depth of 60 inches or more is brown fine sandy loam.

Permeability of the Ima soil is moderately rapid. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

The Armesa soil is deep and well drained. It formed in calcareous alluvium derived dominantly from sandstone and shale. Typically, the surface layer is yellowish brown fine sandy loam about 3 inches thick. The subsoil is brown sandy clay loam about 8 inches thick. The substratum to a depth of 60 inches or more is very pale brown sandy clay loam that is more than 40 percent calcium carbonate.

Permeability of the Armesa soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

This unit is used for livestock grazing and wildlife habitat.

The potential natural plant community on the Ima soil is characterized mainly by blue grama, sand dropseed, sideoats grama, and black grama. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the desirable forage plants such as black grama and sideoats grama decrease and blue grama forms a dense, low turf that is low in productivity. Species that are present in the plant community in smaller amounts such as buffalograss, threeawn, yucca, and broom snakeweed increase, and mesquite invades. Areas that are heavily infested with less desirable plants can be improved by chemical or mechanical treatment.

The average annual production of air-dry vegetation on the Ima soil ranges from 1,600 pounds per acre in favorable years to 800 pounds in unfavorable years.

The potential natural plant community on the Armesa soil is characterized mainly by black grama, sideoats grama, New Mexico feathergrass, and blue grama. As the plant community deteriorates, the desirable forage plants decrease and there is an increase in threeawn, wolftail, and broom snakeweed, which normally are present only in small amounts in the potential plant community. Grazing management should be designed to increase the productivity and reproduction of black grama, sideoats grama, and New Mexico feathergrass.

The average annual production of air-dry vegetation on the Armesa soil ranges from 1,400 pounds per acre in favorable years to 500 pounds in unfavorable years.

Practices that facilitate rangeland management, such as installing fences and pipelines and troughs for supplying water for livestock, are suited to this unit. This unit has limited suitability for pit tanks and earthen ponds because of the seepage potential. The unit is suited to rangeland management practices such as proper grazing use and deferred grazing.

14—Kolar-Chispa-Neso association, 0 to 5 percent slopes. This map unit is on mesas, hillslopes, and ridges. Areas are generally irregular in shape, but some are long and narrow; they are 300 to 1,500 acres in size. The native vegetation is mainly short grasses. Elevation

is 4,000 to 4,500 feet. The average annual precipitation is about 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

This unit is 40 percent Kolar very fine sandy loam, 0 to 5 percent slopes, 25 percent Chispa fine sandy loam, 0 to 5 percent slopes, and 20 percent Neso gravelly fine sandy loam, 0 to 5 percent slopes. The Kolar soil is in slightly concave areas, the Chispa soil is on concave hillslopes, and the Neso soil is in slightly convex areas.

Included in this unit are small areas of Armesa soils on ridges and convex hillslopes. In areas near the Chaves County boundary are soils that are similar to the Kolar soil but do not have so much organic matter and soils that are similar to the Chispa soil but have a deeper zone of lime accumulation. Included areas make up about 15 percent of the total acreage.

The Kolar soil is shallow and well drained. It formed in calcareous alluvium derived from mixed sources. Typically, the surface layer is brown very fine sandy loam about 4 inches thick. The subsoil is brown very fine sandy loam about 7 inches thick. The substratum is light brown gravelly very fine sandy loam about 7 inches thick. Indurated caliche is at a depth of 18 inches.

Permeability of the Kolar soil is moderately rapid. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The Chispa soil is deep and well drained. It formed in calcareous alluvium derived dominantly from shale and sandstone. Typically, the surface layer is brown fine sandy loam about 8 inches thick. The subsoil is yellowish red and reddish yellow sandy clay loam about 27 inches thick. The substratum to a depth of 60 inches or more is pink sandy clay loam.

Permeability of the Chispa soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is nonsaline or slightly saline.

The Neso soil is shallow and well drained. It formed in broken hard caliche and loamy material derived from mixed sources. Typically, the surface layer is brown gravelly fine sandy loam about 5 inches thick. The next layer is brown very cobbly fine sandy loam about 9 inches thick. Indurated caliche is at a depth of 14 inches.

Permeability of the Neso soil is moderately rapid. Available water capacity is very low. Effective rooting depth is 8 to 14 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

This unit is used for livestock grazing and wildlife habitat.

The potential plant community on the Kolar soil is mainly blue grama, black grama, and sideoats grama. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the desirable forage plants such as New Mexico feathergrass, black grama, sideoats grama, and little bluestem decrease and there is an increase in threeawn, broom snakeweed, and yucca, which normally are present only in small amounts in the potential plant community.

The Kolar soil is suited to management practices such as proper grazing use and deferred grazing. Fences and livestock water pipelines are difficult to install on this soil because of the shallow depth to caliche.

The potential natural plant community on the Chispa soil is mainly blue grama, black grama, and sideoats grama. As the plant community deteriorates, the desirable forage plants such as black grama decrease and blue grama forms a dense, low turf that is low in productivity. Species that are present in the plant community in smaller amounts such as threeawn, buffalograss, and broom snakeweed increase, and mesquite invades.

Practices that facilitate rangeland management, such as installing fences, earthen ponds, and pipelines and troughs for supplying water for livestock, are suited to this soil.

The potential natural plant community on the Neso soil is mainly blue grama, black grama, sideoats grama, and New Mexico feathergrass. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the desirable forage plants such as black grama and New Mexico feathergrass decrease and there is an increase in threeawn, ring muhly, broom snakeweed, and yucca, which normally are present only in small amounts in the potential plant community. Areas that are heavily infested with less desirable plants can be improved by chemical treatment.

The Neso soil is suited to rangeland management practices such as proper grazing use and deferred grazing. Fences and livestock water pipelines are difficult to install on this soil because of shallow depth to indurated caliche.

Grazing management that will sustain or increase the vigor, production, and reproduction of the more palatable and productive grasses and shrubs should be implemented on this unit. Use of planned grazing systems that vary the seasons of grazing and rest during successive years results in a balanced plant community that provides a variety of high-quality forage during all seasons of the year. Flexibility in the number of livestock and in the frequency and intensity of grazing is essential to the success of any grazing program.

The average annual production of air-dry vegetation on the Kolar soil ranges from 1,400 pounds per acre in favorable years to 450 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Neso soil ranges from 900 pounds per acre in favorable years to 250 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Chispa soil ranges from 1,600 pounds per acre in favorable years to 800 pounds in unfavorable years.

16—Roswell-Berwolf association, 3 to 20 percent slopes. This map unit is on uplands. Areas are irregular in shape and are 300 to 2,500 acres in size. The native vegetation is mainly grass. Elevation is 4,000 to 4,800 feet. The average annual precipitation is about 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

This unit is 70 percent Roswell fine sand, 3 to 20 percent slopes, and 20 percent Berwolf loamy fine sand, 3 to 5 percent slopes. The Roswell soil is in convex areas and on dunes, and the Berwolf soil is in plane to concave areas.

Included in this unit are small areas of Armesa soils on isolated small knobs. In some areas are blowouts in which the soil material has been blown away and a hard layer, either sandstone, shale, or caliche, has been exposed. In some areas near the Chaves County boundary are soils that are similar to the Roswell and Berwolf soils but have a higher clay content in the subsoil or have a thicker surface layer. Included areas make up about 10 percent of the total acreage.

The Roswell soil is deep and excessively drained. It formed in eolian material derived dominantly from sandstone and shale. Typically, the surface layer is reddish brown fine sand about 13 inches thick. The substratum to a depth of 60 inches or more is light reddish brown fine sand.

Permeability of the Roswell soil is rapid. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is very high.

The Berwolf soil is deep and well drained. It formed in eolian and alluvial deposits derived dominantly from sandstone and shale. Typically, the surface layer is brown loamy fine sand about 16 inches thick. The subsoil is brown sandy loam about 19 inches thick. The substratum to a depth of 60 inches or more is strong brown loamy fine sand.

Permeability of the Berwolf soil is moderately rapid. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is very high.

This unit is used for livestock grazing and wildlife habitat.

The potential natural plant community on the Roswell soil is mainly sand bluestem, little bluestem, sand dropseed, and sand sagebrush. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the desirable forage plants such as sand bluestem, little bluestem, indiangrass, and sideoats grama decrease and there is an increase in threeawn, hairy grama, field sandbur, and sand dropseed, which normally are present only in small amounts in the potential plant community.

The potential natural plant community on the Berwolf soil is mainly little bluestem, sand bluestem, and sand dropseed. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the desirable forage plants such as sand bluestem, little bluestem, and indiangrass decrease and there is an increase in threeawn, hairy grama, sand dropseed, and sand sagebrush, which normally are present only in small amounts in the potential plant community.

Sufficient residue and litter must be maintained on this unit to reduce soil blowing and damage to young plants. The unit is suited to such rangeland management practices as fencing, installing pipelines and storage facilities for livestock water, and aerial spraying for the management of undesirable plants. Practices that facilitate rangeland management, such as constructing pit tanks and ponds, are not suited to this unit because of the seepage potential. Grazing management that will sustain or increase the vigor, production, and reproduction of the more palatable and productive grasses and shrubs should be implemented. Use of planned grazing systems that vary the seasons of grazing and rest during successive years results in a balanced plant community that provides a variety of high-quality forage during all seasons of the year. Flexibility in the number of livestock and in the frequency and intensity of grazing is essential to the success of any grazing program.

The average annual production of air-dry vegetation on the Roswell soil ranges from 2,500 pounds per acre in favorable years to 1,500 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Berwolf soil ranges from 2,000 pounds per acre in favorable years to 1,100 pounds in unfavorable years.

17—Berwolf loamy fine sand, 0 to 5 percent slopes. This deep, well drained soil is on uplands. It formed in alluvial and eolian material derived dominantly from sandstone and shale. Areas are irregular in shape and are 150 to 1,500 acres in size. The native vegetation is mainly grass. Elevation is 3,700 to 4,800 feet. The average annual precipitation is about 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

Typically, the surface layer is strong brown loamy fine sand about 11 inches thick. The upper 10 inches of the subsoil is reddish brown fine sandy loam about 10 inches thick, and the lower part is yellowish red fine sandy loam about 15 inches thick. The substratum to a depth of 60 inches or more is light reddish brown fine sandy loam.

Included in this unit are small areas of Redona soils in swales, Roswell soils on dunes, and Pojo soils on ridges.

In some areas near the Chaves County boundary are soils that are similar to the Berwolf soil but have a thicker surface layer and a higher clay content in the subsoil. Included areas make up about 20 percent of the total acreage.

Permeability of this Berwolf soil is moderately rapid. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is very high.

This unit is used for livestock grazing and wildlife habitat.

The potential natural plant community on this unit is characterized by little bluestem, sand bluestem, and sand dropseed. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the desirable forage plants such as sand bluestem, little bluestem, and indiangrass decrease and there is an increase in sand dropseed, threeawn, yucca, and sand sagebrush, which normally are present only in smaller amounts in the potential plant community.

Sufficient residue and litter must be maintained on this unit to prevent soil blowing and damage to young plants. The unit is limited for livestock watering ponds and other impoundments because of the seepage potential. It is suited to rangeland management practices such as proper grazing use and deferred grazing. Grazing management that will sustain or increase the vigor, production, and reproduction of the more palatable and productive grasses and shrubs should be implemented. Use of planned grazing systems that vary the seasons of grazing and rest during successive years results in a balanced plant community that provides a variety of high-quality forage during all seasons of the year. Flexibility in the number of livestock and in the frequency and intensity of grazing is essential to the success of any grazing program.

The average annual production of air-dry vegetation ranges from 2,000 pounds per acre in favorable years to 1,100 pounds in unfavorable years.

21—Holloman-Rock outcrop complex, 15 to 35 percent slopes. This map unit is on hillslopes and escarpments. Areas commonly are elongated, but in some places they are irregular in shape; they are 200 to 1,000 acres in size. The native vegetation is mainly short grasses and some brushy plants. Elevation is 3,800 to 5,200 feet. The average annual precipitation is about 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

This unit is 40 percent Holloman loam, 15 to 25 percent slopes, and 40 percent Rock outcrop. The Holloman soil is on hillslopes and ledges, and Rock outcrop is on hillslopes and ridges. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of San Jon soils, Reeves soils, and Poquita soils in less sloping areas. Included areas make up about 20 percent of the total acreage.

The Holloman soil is very shallow and shallow and is well drained. It formed in residuum derived dominantly from gypsiferous material. Typically, the surface layer is yellowish brown loam about 3 inches thick. The next layer is light gray loam about 10 inches thick. Gypsum is at a depth of 13 inches.

Permeability of the Holloman soil is moderate. Available water capacity is very low. Effective rooting depth is 5 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is slightly saline to moderately saline.

Rock outcrop consists of highly eroded gypsum. It is white to red in color and is soft to very hard. It supports only sparse vegetation.

This unit is used for livestock grazing and wildlife habitat. Some areas have been used for mining gypsum.

The potential natural plant community on the Holloman soil is characterized mainly by gyp grama, black grama, blue grama, gyp dropseed, fourwing saltbush, and coldenia. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the desirable forage plants such as black grama and fourwing saltbush decrease and there is an increase in gyp grama, burrograss, and gyp dropseed, which normally are present only in small amounts in the potential plant community.

This soil is suited to rangeland management practices such as proper grazing use and deferred grazing. It has limited suitability for practices that facilitate rangeland management, such as installation of livestock water pipelines, water storage facilities, and fences, because of the very shallow and shallow depth to gypsum and the high corrosivity to steel and concrete. The soil is limited for livestock watering ponds and other impoundments because of the very shallow and shallow depth to gypsum and the seepage potential. Grazing management that will sustain or increase the vigor, production, and reproduction of the more palatable and productive grasses and shrubs should be implemented. Use of planned grazing systems that vary the seasons of grazing and rest during successive years results in a balanced plant community that provides a variety of high-quality forage during all seasons of the year. Flexibility in the number of livestock and in the frequency and intensity of grazing is essential to the success of any grazing program.

The average annual production of air-dry vegetation on the Holloman soil ranges from 600 pounds per acre in favorable years to 250 pounds in unfavorable years.

24—Tucumcari-Montoya clay loams, 0 to 3 percent slopes. This map unit is on basin floors (fig. 1). Areas are irregular in shape and are 200 to 1,500 acres in size. The native vegetation is mainly grass. Elevation is 4,000 to 4,500 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

This unit is 55 percent Tucumcari clay loam, 0 to 3 percent slopes, and 40 percent Montoya clay loam, 0 to 3 percent slopes. The Tucumcari soil is on concave foot slopes, and the Montoya soil is on toe slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of La Lande and Redona soils on the lower toe slopes. Included areas make up about 5 percent of the total acreage.

The Tucumcari soil is deep and well drained. It formed in alluvium derived dominantly from red-bed sandstone and shale. Typically, the surface layer is reddish brown clay loam about 5 inches thick. The subsoil is reddish brown clay about 40 inches thick. The substratum to a depth of 60 inches or more is reddish brown clay.

Figure 1.—Typical area of tobosa on Tucumcari-Montoya clay loams, 0 to 3 percent slopes.

Permeability of the Tucumcari soil is moderately slow. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

The Montoya soil is deep and well drained. It formed in alluvium derived dominantly from red-bed sandstone and shale. Typically, the surface layer is reddish brown clay loam about 3 inches thick. The subsoil to a depth of 60 inches or more is reddish brown and dark reddish brown clay.

Permeability of the Montoya soil is very slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is subject to rare periods of flooding after heavy rains. It is nonsaline to slightly saline.

This unit is used for livestock grazing and wildlife habitat.

The potential natural plant community on this unit is characterized by alkali sacaton, tobosa, and vine-mesquite. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the desirable forage plants such as vine-mesquite and blue grama decrease and there is an increase in tobosa, alkali sacaton, and burrograss, which normally are present only in small amounts in the potential plant community.

This unit is suited to practices that facilitate rangeland management, such as installing livestock water pipelines, water storage facilities, pit tanks, ponds, and fences. Grazing management that will sustain or increase the vigor, production, and reproduction of the more palatable and productive grasses and shrubs should be implemented. The seasonal suitability of some plants in the plant community for use as forage should be considered. Use of planned grazing systems that vary the seasons of grazing and rest during successive years results in a balanced plant community that provides a variety of high-quality forage during all seasons of the year. Flexibility in the number of livestock and in the frequency and intensity of grazing is essential to the success of any grazing program.

The average annual production of air-dry vegetation ranges from 2,800 pounds per acre in favorable years to 1,200 pounds in unfavorable years.

25—Chispa-Gallen association, 1 to 10 percent slopes. This map unit is on uplands and hillslopes. Areas are irregular in shape and are 200 to 1,000 acres in size. The native vegetation is mainly grasses. Elevation is 4,000 to 5,000 feet. The average annual precipitation is about 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

This unit is 50 percent Chispa loam, 1 to 5 percent slopes, and 40 percent Gallen gravelly loam, 2 to 10 percent slopes. The Chispa soil is on hillslopes, and the Gallen soil is on knobs and ridges.

Included in this unit are small areas of Redona soils in small swales and Armesa and Kolar soils on ridges. Included areas make up about 10 percent of the total acreage.

The Chispa soil is deep and well drained. It formed in calcareous alluvium derived dominantly from sandstone and shale. Typically, the surface layer is yellowish brown loam about 10 inches thick. The subsoil is light brown clay loam about 28 inches thick. The substratum to a depth of 60 inches or more is pink loam that is high in content of calcium carbonate.

Permeability of the Chispa soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high. This soil is nonsaline to slightly saline.

The Gallen soil is deep and well drained. It formed in alluvium derived dominantly from gravelly, calcareous material. Typically, the surface layer is brown gravelly loam about 6 inches thick. The subsoil is light brown very gravelly loam about 15 inches thick. The upper part of the substratum is pinkish gray extremely gravelly fine sandy loam about 12 inches thick, and the lower part to a depth of 60 inches or more is light brown extremely gravelly sand.

Permeability of the Gallen soil is moderately rapid. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used for livestock grazing and wildlife habitat and as a source of gravel.

The potential plant community on the Chispa soil is mainly blue grama, tobosa, vine-mesquite, and sideoats grama. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the desirable forage plants such as vine-mesquite and sideoats grama decrease and blue grama forms a dense, low turf that is low in productivity. Species that are present in the plant community in smaller amounts such as threeawn, ring muhly, and broom snakeweed increase, and mesquite invades.

Practices that facilitate rangeland management, such as installing livestock water pipelines, water storage facilities, pit tanks, ponds, and fences, are suited to this soil. Areas that are heavily infested with less desirable plants can be improved by chemical or mechanical treatment.

Effective livestock distribution is most frequently accomplished by installing livestock water pipelines and water storage facilities, fencing, and placing salt away from sources of water.

The potential plant community on the Gallen soil is mainly black grama, blue grama, sideoats grama, and New Mexico feathergrass. Continuous yearlong grazing

generally results in a deteriorated plant community. As the plant community deteriorates, the desirable forage plants decrease and there is an increase in threeawn, sand dropseed, and broom snakeweed, which normally are present only in small amounts in the potential plant community.

Livestock water pipelines, livestock watering ponds and other impoundments, and fences are difficult to install on this soil because of the high content of gravel.

This unit is suited to rangeland management practices such as proper grazing use and deferred grazing. Grazing management that will sustain or increase the vigor, production, and reproduction of the more palatable and productive grasses and shrubs should be implemented. Use of planned grazing systems that vary the seasons of grazing and rest during successive years results in a balanced plant community that provides a variety of high-quality forage during all seasons of the year. Flexibility in the number of livestock and in the frequency and intensity of grazing is essential to the success of any grazing program.

The average annual production of air-dry vegetation on the Chispa soil ranges from 1,600 pounds per acre in favorable years to 800 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Gallen soil ranges from 1,200 pounds per acre in favorable years to 450 pounds in unfavorable years.

26—Holloman-Reeves complex, 1 to 15 percent slopes. This map unit is on uplands. Areas are irregular in shape and are 300 to 2,000 acres in size. The native vegetation is mainly short grasses (fig. 2). Elevation is 4,000 to 4,800 feet. The average annual precipitation is about 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

This unit is 65 percent Holloman silt loam, 1 to 15 percent slopes, and 25 percent Reeves loam, 1 to 7 percent slopes. The Holloman soil is in nearly level to convex areas on uplands, and the Reeves soil is in concave areas. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Tucumcari soils in concave areas, soils that are similar to the Holloman soil and are in similar positions but that have soft gypsum in the substratum, and San Jon soils on shale and sandstone benches. Included areas make up about 10 percent of the total acreage.

The Holloman soil is very shallow and shallow and is well drained. It formed in residuum derived from gypsiferous material. Typically, the surface layer is light brownish gray silt loam about 5 inches thick. The next layer is gypsiferous very pale brown loam about 9 inches thick. Gypsum is at a depth of 14 inches.

Permeability of the Holloman soil is moderate. Available water capacity is very low. Effective rooting depth is 5 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is slightly saline to moderately saline.

The Reeves soil is moderately deep to gypsiferous material and is well drained. It formed in loamy alluvium derived dominantly from gypsum. Typically, the surface layer is brown loam about 15 inches thick. The subsoil is light brown loam about 20 inches thick. The substratum to a depth of 60 inches or more is light gray gypsum.

Permeability of the Reeves soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high. This soil is nonsaline to slightly saline.

This unit is used for livestock grazing and wildlife habitat.

The potential natural plant community on the Holloman soil is characterized mainly by gyp grama, blue grama, alkali sacaton, black grama, and coldenia. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the desirable forage plants such as gyp dropseed and tobosa decrease and there is an increase in gyp grama, burrograss, and coldenia, which normally are present only in small amounts in the potential plant community. Deterioration of the vegetation on this soil often results in the formation of gullies.

The potential natural plant community on the Reeves soil is characterized mainly by blue grama, tobosa, alkali sacaton, and sideoats grama. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the desirable forage plants decrease and there is an increase in ring muhly, burrograss, alkali sacaton, and tobosa, which normally are present only in small amounts in the potential plant community. Walkingstick cholla may invade this soil. The Reeves soil receives extra runoff from adjacent areas. Because of this, it is the major forage producing component of the unit.

This unit has limited suitability for practices that facilitate rangeland management, such as construction of livestock water storage facilities, because of the corrosivity of the soil to steel and concrete. The unit has severe limitations for ponds because of the piping and seepage potential. Grazing management that will sustain or increase the vigor, production, and reproduction of the more palatable and productive grasses and shrubs should be implemented. Use of planned grazing systems that vary the seasons of grazing and rest during successive years results in a balanced plant community that provides a variety of high-quality forage during all seasons of the year. Flexibility in the number of livestock and in the frequency and intensity of grazing is essential to the success of any grazing program.

The average annual production of air-dry vegetation on the Holloman soil ranges from 750 pounds per acre in favorable years to 300 pounds in unfavorable years.

Figure 2.—Typical vegetation in an area of Holloman-Reeves complex, 1 to 15 percent slopes.

The average annual production of air-dry vegetation on the Reeves soil ranges from 1,600 pounds per acre in favorable years to 700 pounds in unfavorable years.

27—Los Tanos-Latom fine sandy loams, 0 to 5 percent slopes. This map unit is on sandstone ledges and benches. Areas are irregular in shape and are 200 to 1,000 acres in size. The native vegetation is mainly short grasses. Elevation is 4,000 to 5,200 feet. The average annual precipitation is about 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

This unit is 45 percent Los Tanos fine sandy loam, 0 to 5 percent slopes, and 30 percent Latom fine sandy loam, 0 to 5 percent slopes. The soils occupy similar positions. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Kolar fine sandy loam on ridges, Berwolf fine sandy loam on concave side slopes, and Rock outcrop on the highest ridges. Included areas make up about 25 percent of the total acreage.

The Los Tanos soil is moderately deep and well drained. It formed in residuum derived dominantly from sandstone. Typically, the surface layer is brown fine sandy loam about 5 inches thick. The subsoil is yellowish red and light reddish brown fine sandy loam about 16 inches thick. Sandstone is at a depth of 21 inches.

Permeability of the Los Tanos soil is moderately rapid. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

The Latom soil is very shallow and shallow and is well drained. It formed in residuum derived dominantly from sandstone. Typically, the surface layer is brown fine sandy loam about 4 inches thick. The substratum is brown fine sandy loam about 4 inches thick. Sandstone is at a depth of 8 inches.

Permeability of the Latom soil is moderately rapid. Available water capacity is very low. Effective rooting depth is 5 to 20 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

This unit is used for livestock grazing and wildlife habitat.

The potential natural plant community on the Los Tanos soil is characterized mainly by blue grama, sideoats grama, black grama, and little bluestem. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the desirable forage plants such as black grama and sideoats grama decrease and blue grama forms a dense, low turf that is low in productivity. Species that are present in the plant community in smaller amounts such as threeawn, sand dropseed, yucca, and broom snakeweed increase, and mesquite invades. Areas that are heavily infested with less desirable plants can be improved by chemical or mechanical treatment.

This soil is suited to rangeland management practices such as deferred grazing and proper grazing use. Practices that facilitate rangeland management, such as installing ponds, are limited because of the moderate depth to sandstone and the seepage potential. Effective livestock distribution is most frequently accomplished by installing livestock water storage facilities, fencing, and placing salt away from sources of water.

The potential natural plant community on the Latom soil is characterized mainly by blue grama, sideoats grama, New Mexico feathergrass, and black grama. It also has a significant amount of woody plants, including juniper, sumac, and sacahuista. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the desirable forage plants such as New Mexico feathergrass and black grama decrease and there is an increase in sacahuista, threeawn, and broom snakeweed, which normally are present only in small amounts in the potential plant community. This soil is suited to rangeland management practices such as grazing management systems, proper grazing use, and deferred grazing. Livestock grazing should be managed to protect the soil from excessive erosion, which results in loss of topsoil and reduced production. Effective livestock distribution is most frequently accomplished by placing salt away from sources of water. This soil has limited suitability for practices that facilitate rangeland management, such as installing livestock water pipelines and fences, because of the very shallow and shallow depth to sandstone. Grazing management that will sustain or increase the vigor, production, and reproduction of the more palatable and productive grasses and shrubs should be implemented. Use of planned grazing systems that vary the seasons of grazing and rest during successive years results in a balanced plant community that provides a variety of high-quality forage during all seasons of the year. Flexibility in the number of livestock and in the frequency and intensity of grazing is essential to the success of any grazing program.

The average annual production of air-dry vegetation on the Los Tanos soil ranges from 1,600 pounds per acre in favorable years to 800 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Latom soil ranges from 1,200 pounds per acre in favorable years to 400 pounds in unfavorable years.

30—Ustifluvents, 0 to 3 percent slopes. These deep, well drained to somewhat poorly drained soils are on flood plains and low terraces (fig. 3). They formed in alluvium derived from mixed sources. Areas are elongated in shape and are 100 to 600 acres in size. The native vegetation is mainly short and mid grasses. Elevation is 3,700 to 4,800 feet. The average annual precipitation is about 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

In a reference profile, the surface layer is reddish brown fine sandy loam about 12 inches thick. Below this to a depth of 60 inches or more is stratified gravelly loamy coarse sand and clay loam.

Included in this unit are small areas of Ima soils on terraces above the Pecos River and Minneosa soils on flood plains. Included areas make up 30 percent of the total acreage.

Permeability of Ustifluvents is moderately rapid to slow. Available water capacity is moderate to high. Effective rooting depth is 60 inches or more. Runoff is slow to rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight to high. These soils are subject to rare periods of flooding after heavy rains.

This unit is used for livestock grazing and wildlife habitat.

The potential natural plant community on this unit is characterized by giant sacaton, alkali sacaton, vine-mesquite, and tobosa. Continuous yearlong grazing

Figure 3.—Typical area of Ustifluvents, 0 to 3 percent slopes.

generally results in a deteriorated plant community. As the plant community deteriorates, the desirable forage plants such as vine-mesquite and sideoats grama decrease and there is an increase in giant sacaton, muhly, inland saltgrass, and seepwillow, which normally are present in smaller amounts in the potential plant community. Saltcedar and Russian-olive readily invade this unit. Areas that are heavily infested with less desirable plants can be improved by chemical or mechanical treatment or by controlled burning.

Maximum production on this unit can be achieved by seasonal mowing and intensive grazing management. The seasonal suitability of some plants in the plant community for use as forage should be considered. The unit is suited to rangeland management practices such as proper grazing use and deferred grazing. Effective livestock distribution is most frequently accomplished by the use of water storage facilities, fencing, and placing salt away from sources of water. This unit is limited for livestock watering ponds and other impoundments because of the seepage potential. Grazing management that will sustain or increase the vigor, production, and reproduction of the more palatable and productive grasses and shrubs should be implemented. Use of planned grazing systems that vary the seasons of

grazing and rest during successive years results in a balanced plant community that provides a variety of high-quality forage during all seasons of the year. Flexibility in the number of livestock and in the frequency and intensity of grazing is essential to the success of any grazing program.

The average annual production of air-dry vegetation ranges from 5,200 pounds per acre in favorable years to 1,600 pounds in unfavorable years.

31—Chispa-Redona association, 0 to 3 percent slopes. This map unit is on uplands. Areas are irregular in shape and are 250 to 3,000 acres in size. The native vegetation is mainly short grasses. Elevation is 4,000 to 5,000 feet. The average annual precipitation is about 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

This unit is 50 percent Chispa fine sandy loam, 0 to 3 percent slopes, and 40 percent Redona fine sandy loam, 0 to 3 percent slopes. The Chispa soil is in convex areas, and the Redona soil is in plane to concave areas.

Included in this unit are small areas of Kolar soils on small ridges. Included areas make up about 10 percent of the total acreage.

The Chispa soil is deep and well drained. It formed in calcareous alluvium derived dominantly from sandstone and shale. Typically, the surface layer is brown fine sandy loam about 7 inches thick. The subsoil is reddish brown and pink sandy clay loam about 36 inches thick. The substratum to a depth of 60 inches or more is pink sandy clay loam.

Permeability of the Chispa soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is nonsaline to slightly saline.

The Redona soil is deep and well drained. It formed in alluvium derived dominantly from sandstone and shale. Typically, the surface layer is reddish brown fine sandy loam about 8 inches thick. The upper part of the subsoil is reddish brown fine sandy loam and sandy clay loam about 24 inches thick, and the lower part is red sandy clay loam about 7 inches thick. The substratum to a depth of 60 inches or more is light red and pink sandy clay loam.

Permeability of the Redona soil is moderate. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

This unit is used for livestock grazing and wildlife habitat.

The potential plant community on this unit is mainly blue grama, black grama, sideoats grama, and plains bristlegrass. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the desirable forage plants such as black grama, sideoats grama, little bluestem, and plains bristlegrass decrease and blue grama forms a dense, low turf that is low in productivity. Species that are present in the plant community in smaller amounts such as threeawn, sand dropseed, ring muhly, and broom snakeweed increase, and mesquite invades. Areas that are heavily infested with less desirable plants can be improved by chemical or mechanical treatment.

This unit is suited to rangeland management practices such as deferred grazing and proper range use. Practices that facilitate rangeland management, such as installing livestock water pipelines, water storage facilities, fences, pit tanks, and ponds, are suited to this unit. Effective livestock distribution is most frequently accomplished by installing livestock water storage facilities, fencing, and placing salt away from sources of water. Use of planned grazing systems that vary the seasons of grazing and rest during successive years results in a balanced plant community that provides a variety of high-quality forage during all seasons of the year. Flexibility in the number of livestock and in the frequency and intensity of grazing is essential to the success of any grazing program.

The average annual production of air-dry vegetation ranges from 1,600 pounds per acre in favorable years to 700 pounds in unfavorable years.

32—Friona sandy clay loam, 0 to 3 percent slopes. This moderately deep, well drained soil is on mesas. It formed in alluvium. Areas are irregular in shape and are 1,000 to 3,000 acres in size. The native vegetation is mainly short grasses. Elevation is 4,500 to 4,900 feet. The average annual precipitation is about 14 to 16 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

Typically, the surface layer is reddish brown sandy clay loam about 6 inches thick. The subsoil is reddish brown sandy clay loam about 20 inches thick. Indurated caliche is at a depth of 26 inches.

Included in this unit are small areas of Sharvana and Slaughter soils on ridges, Berwolf soils in sandy areas, and a deep clayey soil in broad swales. Included areas make up about 25 percent of the total acreage.

Permeability of this soil is moderate. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used for livestock grazing, as nonirrigated cropland, and for wildlife habitat. The main crop is small grain, but small acreages of grain sorghum and other crops are also grown.

The potential natural plant community on this unit is characterized by blue grama, western wheatgrass, and sideoats grama. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the desirable forage plants such

as western wheatgrass, vine-mesquite, and sideoats grama decrease and blue grama forms a dense, low turf that is low in productivity. Species that are present in the plant community in smaller amounts such as threeawn, buffalograss, and ring muhly increase, and walkingstick cholla invades. Areas that are heavily infested with less desirable plants can be improved by chemical or mechanical treatment.

This unit is suited to rangeland management practices such as proper grazing use and deferred grazing. Practices that facilitate rangeland management, such as installing ponds, are limited by the moderate depth to caliche; however, practices such as installing fences and pipelines and troughs for supplying water for livestock are suited to this unit. Grazing management that will sustain or increase the vigor, production, and reproduction of the more palatable and productive grasses and shrubs should be implemented. Use of planned grazing systems that vary the seasons of grazing and rest during successive years results in a balanced plant community that provides a variety of high-quality forage during all seasons of the year. Flexibility in the number of livestock and in the frequency and intensity of grazing is essential to the success of any grazing program.

The average annual production of air-dry vegetation ranges from 1,600 pounds per acre in favorable years to 700 pounds in unfavorable years.

This unit is suited to nonirrigated farming practices such as terracing, using conservation cropping systems, using crop residue, and tilling on the contour. Stubble mulching, summer fallowing, or other moisture conserving practices are needed for successful crop production.

34—Gallen-Torriorthents association, 15 to 35 percent slopes. This map unit is on hillslopes. Areas are irregular and elongated in shape and are 200 to 1,500 acres in size. The native vegetation is mainly grass. Elevation is 4,000 to 4,500 feet. The average annual precipitation is about 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

This unit is 70 percent Gallen very gravelly sandy loam, 5 to 35 percent slopes, and 20 percent Torriorthents, 15 to 35 percent slopes. The Gallen soil is on foot slopes and shoulders, and the Torriorthents are on toe slopes.

Included in this unit are small areas of Latom soils on ledges and Rock outcrop on ridges and ledges. Also included are areas of soils that have slopes of less than 15 percent. Included areas make up about 10 percent of the total acreage.

The Gallen soil is deep and well drained. It formed in alluvium derived dominantly from gravelly, calcareous material. Typically, the surface layer is brown very gravelly sandy loam about 8 inches thick. The subsoil is brown very gravelly sandy loam about 32 inches thick. The substratum to a depth of 60 inches or more is light brown very gravelly loamy sand.

Permeability of the Gallen soil is moderately rapid. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Torriorthents are deep and well drained. They formed in alluvium derived from mixed sources. In a reference profile, the surface layer is brown gravelly fine sandy loam about 3 inches thick. The next layer is light brown fine sandy loam about 35 inches thick. Below this to a depth of 60 inches or more is light brown very gravelly fine sandy loam.

Permeability of the Torriorthents is moderate to moderately rapid. Available water capacity is moderate to high. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

This unit is used for livestock grazing and wildlife habitat.

The potential natural plant community on the Gallen soil is characterized mainly by black grama, blue grama, sideoats grama, and New Mexico feathergrass. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the desirable forage plants decrease and there is an increase in threeawn, sand dropseed, and ring muhly, which normally are present only in small amounts in the potential plant community.

This soil is suited to rangeland management practices such as proper grazing use and deferred grazing. The soil has limited suitability for practices that facilitate rangeland management, such as installing livestock water pipelines and fences, because of gravel in soil profile. The soil is limited for livestock watering ponds and other impoundments because of the seepage potential and slope.

The Torriorthents have limited suitability for grazing because of the steepness of slope and the sparseness of usable forage. Grazing management that will sustain or increase the vigor, production, and reproduction of the more palatable and productive grasses and shrubs should be implemented. Use of planned grazing systems that vary the seasons of grazing and rest during successive years results in a balanced plant community that provides a variety of high-quality forage during all seasons of the year. Flexibility in the number of livestock and in the frequency and intensity of grazing is essential to the success of any grazing program.

The average annual production of air-dry vegetation ranges from 1,200 pounds per acre in favorable years to 450 pounds in unfavorable years.

35—Tucumcari-Redona association, 0 to 3 percent slopes. This map unit is in broad valleys and on toe

slopes. Areas are irregular in shape and are 200 to 1,000 acres in size. The native vegetation is mainly short grasses. Elevation is 4,000 to 5,000 feet. The average annual precipitation is about 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

This unit is 55 percent Tucumcari sandy clay loam, 0 to 2 percent slopes, and 35 percent Redona sandy clay loam, 0 to 3 percent slopes. The Tucumcari soil is in broad valleys, and the Redona soil is on toe slopes adjacent to broad valleys.

Included in this unit are small areas of Chispa soils on convex toe slopes. Included areas make up about 10 percent of the total acreage.

The Tucumcari soil is deep and well drained. It formed in alluvium derived dominantly from red-bed sandstone and shale. Typically, the surface layer is reddish brown sandy clay loam about 7 inches thick. The subsoil is reddish brown clay about 20 inches thick. The substratum to a depth of 60 inches or more is reddish brown clay.

Permeability of the Tucumcari soil is moderately slow. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Redona soil is deep and well drained. It formed in alluvium derived dominantly from sandstone and shale. Typically, the surface layer is reddish brown sandy clay loam about 5 inches thick. The substratum to a depth of 60 inches or more is reddish brown sandy clay loam.

Permeability of the Redona soil is moderate. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used for livestock grazing and wildlife habitat.

The potential natural plant community on this unit is characterized by blue grama, vine-mesquite, sideoats grama, tobosa, and alkali sacaton. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the desirable forage plants such as vine-mesquite, sideoats grama, plains bristlegrass, and black grama decrease and blue grama forms a dense, low turf that is low in productivity. Species that are present in the plant community in smaller amounts such as tobosa, burrograss, threeawn, and broom snakeweed increase, and mesquite invades. Areas that are heavily infested with less desirable plants can be improved by chemical or mechanical treatment.

This unit is suited to rangeland management practices, such as deferred grazing and proper grazing use. Practices that facilitate rangeland management, such as installing fences, earthen ponds, and pipelines and troughs for supplying water for livestock, are suited to this unit. Effective livestock distribution is most frequently accomplished by installing water storage facilities and fences and placing salt away from sources of water. Grazing management that will sustain or increase the vigor, production, and reproduction of the more palatable and productive grasses and shrubs should be implemented. Use of planned grazing systems that vary the seasons of grazing and rest during successive years results in a balanced plant community that provides a variety of high-quality forage during all seasons of the year. Flexibility in the number of livestock and in the frequency and intensity of grazing is essential to the success of any grazing program.

The average annual production of air-dry vegetation on the Tucumcari soil ranges from 2,800 pounds per acre in favorable years to 1,200 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Redona soil ranges from 2,500 pounds per acre in favorable years to 700 pounds in unfavorable years.

36—Rock outcrop-Regnier-Latom complex, 30 to 80 percent slopes. This map unit is on sandstone and shale breaks. Areas are irregular and elongated in shape and are 250 to 1,500 acres in size. The native vegetation is mainly grass. Elevation is 4,000 to 5,100 feet. The average annual precipitation is about 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

This unit is 40 percent Rock outcrop; 20 percent Regnier gravelly sandy clay loam, 30 to 80 percent slopes; and 20 percent Latom sandy loam, 30 to 40 percent slopes. Rock outcrop is on ridges and escarpments, the Regnier soil is on hillslopes, and the Latom soil is on sandstone ledges. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of less sloping Los Tanos soils on sandstone ledges. Included areas make up about 20 percent of the total acreage.

Rock outcrop consists of sandstone and shale. It supports little if any vegetation.

The Regnier soil is shallow and well drained. It formed in residuum derived dominantly from shale. Typically, the surface layer is reddish brown gravelly sandy clay loam about 8 inches thick. The substratum is reddish brown sandy clay loam about 8 inches thick. Consolidated shale is at a depth of 16 inches.

Permeability of the Regnier soil is moderately slow. Available water capacity is very low. Effective rooting depth is 12 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Latom soil is very shallow and well drained. It formed in residuum derived dominantly from sandstone. Typically, the surface layer is light reddish brown sandy loam about 8 inches thick. Sandstone is at a depth of 8 inches.

Permeability of the Latom soil is moderately rapid. Available water capacity is very low. Effective rooting depth is 8 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

This unit is used for livestock grazing and wildlife habitat.

The potential natural plant community on this unit is characterized mainly by black grama, sideoats grama, New Mexico feathergrass, and little bluestem. The unit has a significant percentage of woody plants in the potential plant community. This includes sacahuista, skunkbush sumac, juniper, and catclaw acacia. This unit has limited suitability for grazing because of the steepness of slope and sparseness of usable forage.

Grazing management that improves or helps to maintain the plant cover and promotes an accumulation of litter reduces soil erosion and improves the infiltration of moisture.

The average annual production of air-dry vegetation on this unit ranges from 900 pounds per acre in favorable years to 300 pounds in unfavorable years.

37—Ima-Gallen association, 2 to 7 percent slopes. This map unit is on hillslopes. Areas are irregular in shape and are 200 to 2,000 acres in size. The native vegetation is mainly short grasses. Elevation is 4,000 to 4,900 feet. The average annual precipitation is about 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

This unit is 70 percent Ima fine sandy loam, 2 to 5 percent slopes, and 20 percent Gallen gravelly sandy loam, 2 to 7 percent slopes. The Ima soil is on foot slopes and toe slopes, and the Gallen soil is on shoulders.

Included in this unit are small areas of Chispa and Redona soils in concave areas. Included areas make up about 10 percent of the total acreage.

The Ima soil is deep and well drained. It formed in alluvium derived dominantly from sandstone and shale. Typically, the surface layer is brown and light brown fine sandy loam about 12 inches thick. The subsoil is light brown and reddish brown fine sandy loam about 37 inches thick. The substratum to a depth of 60 inches or more is reddish brown fine sandy loam.

Permeability of the Ima soil is moderately rapid. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

The Gallen soil is deep and well drained. It formed in alluvium derived dominantly from gravelly, calcareous material. Typically, the surface layer is reddish brown gravelly sandy loam about 5 inches thick. The subsoil is reddish brown very gravelly sandy loam about 15 inches thick. The substratum to a depth of 60 inches or more is light reddish brown extremely gravelly sandy loam.

Permeability of the Gallen soil is moderately rapid. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

This unit is used for livestock grazing and wildlife habitat.

The potential natural plant community on the Ima soil is characterized mainly by blue grama, sand dropseed, sideoats grama, and black grama. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the desirable forage plants such as sideoats grama and black grama decrease and blue grama forms a dense, low turf that is low in productivity. Species that are present in the plant community in smaller amounts such as buffalograss, threeawn, yucca, and broom snakeweed increase. Areas that are heavily infested with less desirable plants can be improved by chemical or mechanical treatment.

Practices that facilitate rangeland management, such as fencing and installing livestock water pipelines and troughs, are suited to this soil.

The potential natural plant community on the Gallen soil is characterized mainly by black grama, blue grama, sideoats grama, and New Mexico feathergrass. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the desirable forage plants decrease and there is an increase in sand dropseed, threeawn, and broom snakeweed, which normally are present only in small amounts in the potential plant community.

This soil has limited suitability for practices that facilitate rangeland management, such as installing livestock water pipelines and fences, because of the high content of gravel. The soil is limited for livestock watering ponds and other impoundments because of the seepage potential.

This unit is suited to rangeland management practices, such as proper grazing use and deferred grazing. Effective livestock distribution is most frequently accomplished by placing salt away from sources of water, fencing, and developing watering facilities. Grazing management that will sustain or increase the vigor, production, and reproduction of the more palatable and productive grasses and shrubs should be implemented. Use of planned grazing systems that vary the seasons of grazing and rest during successive years results in a balanced plant community that provides a variety of high-quality forage during all seasons of the year. Flexibility in the number of livestock and in the frequency and intensity of grazing is essential to the success of any grazing program.

The average annual production of air-dry vegetation on the Ima soil ranges from 1,600 pounds per acre in favorable years to 800 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Gallen soil ranges from 1,200 pounds per acre in favorable years to 450 pounds in unfavorable years.

39—Sharvana-Slaughter association, 0 to 3 percent slopes. This map unit is on mesas. Areas are irregular in shape and are 300 to 2,000 acres in size. The native vegetation is mainly short grasses. Elevation is 4,400 to 5,000 feet. The average annual precipitation is about 14 to 16 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

This unit is 50 percent Sharvana fine sandy loam, 1 to 3 percent slopes, and 30 percent Slaughter sandy clay loam, 0 to 1 percent slopes. The Sharvana soil is on ridges, and the Slaughter soil is in swales.

Included in this unit are small areas of Friona and Berwolf soils in the deeper swales and small areas of Neso and Kolar soils that are near the edge of breaks and have slopes of 3 to 5 percent. Included areas make up about 20 percent of the total acreage.

The Sharvana soil is shallow and well drained. It formed in calcareous loamy alluvium derived from mixed sources. Typically, the surface layer is brown fine sandy loam about 4 inches thick. The subsoil is reddish brown fine sandy loam about 9 inches thick. Indurated caliche is at a depth of 13 inches.

Permeability of the Sharvana soil is moderate. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

The Slaughter soil is shallow and well drained. It formed in calcareous alluvium derived from mixed sources. Typically, the surface layer is reddish brown sandy clay loam about 2 inches thick. The subsoil is reddish brown clay loam about 15 inches thick. Indurated caliche is at a depth of 17 inches.

Permeability of the Slaughter soil is moderately slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used for livestock grazing and wildlife habitat.

The potential natural plant community on the Sharvana soil is characterized mainly by black grama, sideoats grama, needleandthread, and blue grama. Continuous yearlong grazing by livestock results in a deteriorated plant community. This condition generally is accompanied by accelerated soil erosion. As the plant community deteriorates, the more desirable forage plants decrease and there is an increase in threeawn, sand dropseed, and ring muhly, which normally are present only in small amounts in the potential plant community. Grazing management should be designed to increase the productivity and reproduction of black grama and sideoats grama.

This soil has limited suitability for rangeland management practices, such as installing pipelines for providing water for livestock and constructing ponds, because of the shallow depth to caliche. The soil is suited to management practices such as deferred grazing and proper grazing use.

The potential natural plant community on the Slaughter soil is characterized mainly by blue grama, tobosa, vine-mesquite, western wheatgrass, and sideoats grama. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the more desirable forage plants such as vine-mesquite, western wheatgrass, and sideoats grama decrease and blue grama forms a dense, low turf that is low in productivity. Species that are present in the plant community in smaller amounts such as threeawn increase, and broom snakeweed and mesquite invade. Grazing management should be designed to increase the vigor, productivity, and reproduction of blue grama, vine-mesquite, and sideoats grama. Areas that are heavily infested with less desirable plants can be improved by chemical or mechanical treatment.

Practices that facilitate rangeland management, such as installing pipelines for providing water for livestock and constructing ponds, are difficult to apply on this soil because of the shallow depth to caliche.

Grazing management that will sustain or increase the vigor, production, and reproduction of the more palatable and productive grasses and shrubs should be implemented on this unit. Use of planned grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides a variety of high-quality forage during all seasons of the year. Flexibility in the number of livestock and in the frequency and intensity of grazing is essential to the success of any grazing program.

The average annual production of air-dry vegetation on the Sharvana soil ranges from 1,200 pounds per acre in favorable years to 450 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Slaughter soil ranges from 1,500 pounds per acre in favorable years to 700 pounds in unfavorable years.

40—Pastura-Darvey association, 1 to 10 percent slopes. This map unit is on uplands. Areas are irregular in shape and are 500 to 2,000 acres in size. The native vegetation is mainly short grasses. Elevation is 4,800 to 5,400 feet. The average annual precipitation is about 12 to 14 inches, the average annual air temperature is 55 to 57 degrees F, and the average frost-free period is 160 to 180 days.

This unit is 65 percent Pastura loam, 1 to 10 percent slopes, and 25 percent Darvey loam, 1 to 5 percent slopes. The Pastura soil is on mesas, and the Darvey soil is on hillslopes.

Included in this unit are small areas of Clovis soils in broad swales and Deama soils on hillslopes. Also included are small areas of deeper, darker colored soils in concave areas. Included areas make up about 10 percent of the total acreage.

The Pastura soil is very shallow and shallow and is well drained. It formed in calcareous alluvium derived from mixed sources. Typically, the surface layer is light brownish gray loam about 4 inches thick. The subsoil is brown loam about 6 inches thick. Indurated caliche is at a depth of 10 inches.

Permeability of the Pastura soil is moderate. Available water capacity is very low. Effective rooting depth is 7 to 15 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The Darvey soil is deep and well drained. It formed in calcareous alluvium derived dominantly from limestone. Typically, the surface layer is brown loam about 6 inches thick. The upper part of the subsoil is pale brown loam about 21 inches thick, and the lower part is very pale brown loam about 12 inches thick. The substratum to a depth of 60 inches or more is light yellowish brown loam.

Permeability of the Darvey soil is moderate. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

This unit is used for livestock grazing and wildlife habitat.

The potential natural plant community on the Pastura soil is characterized mainly by blue grama, sideoats grama, and New Mexico feathergrass. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the more desirable forage plants such as sideoats grama and New Mexico feathergrass decrease and there is an increase in wolftail, threeawn, muhly, and broom snakeweed, which normally are present only in small amounts in the potential plant community.

Practices that facilitate rangeland management, such as installing pipelines, pit tanks, and fences, are difficult to apply on this soil because of the very shallow and shallow depth to caliche.

The potential natural plant community on the Darvey soil is characterized mainly by western wheatgrass, blue grama, sideoats grama, and vine-mesquite. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the more desirable forage plants such as black grama, New Mexico feathergrass, sideoats grama, and little bluestem decrease and blue grama forms a dense, low turf that is low in productivity. Species that are present in the plant community in smaller amounts such as wolftail, threeawn, muhly, and broom snakeweed increase, and walkingstick cholla invades.

Practices that facilitate rangeland management, such as rangeland renovation and installation of fences, earthen ponds, and pipelines and troughs for supplying water for livestock, are suited to this soil.

This unit is suited to rangeland management practices such as proper grazing use and deferred grazing. Grazing management that will sustain or increase the vigor, production, and reproduction of the more palatable and productive grasses and shrubs should be implemented. Use of planned grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides a variety of high-quality forage during all seasons of the year. Flexibility in the number of livestock and in the frequency and intensity of grazing is essential to the success of any grazing program.

The average annual production of air-dry vegetation on the Pastura soil ranges from 1,000 pounds per acre in favorable years to 300 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Darvey soil ranges from 1,500 pounds per acre in favorable years to 400 pounds in unfavorable years.

41—Clovis-Pastura association, 0 to 5 percent slopes. This map unit is on mesas, knobs, and ridges and in associated valleys. Areas are irregular in shape and are 200 to 2,000 acres in size. The native vegetation is mainly short grasses. Elevation is 4,800 to 5,400 feet. The average annual precipitation is about 12 to 14 inches, the average annual air temperature is 55 to 57 degrees F, and the average frost-free period is 160 to 180 days.

This unit is 60 percent Clovis loam, 0 to 3 percent slopes, and 25 percent Pastura loam, 0 to 5 percent slopes. The Clovis soil is in broad valleys, and the Pastura soil is on mesas, knobs, and ridges.

Included in this unit are small areas of Darvey soils on hillslopes and small areas of soils that are similar to the Clovis soil but have a darker colored surface layer and are in drainageways. Included areas make up 15 percent of the total acreage.

The Clovis soil is deep and well drained. It formed in loamy material derived from mixed sources. Typically, the surface layer is brown loam about 3 inches thick. The subsoil is brown and reddish brown clay loam and loam about 26 inches thick. The substratum to a depth of 60 inches or more is pink loam.

Permeability of the Clovis soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Pastura soil is shallow and well drained. It formed in calcareous alluvium derived from mixed sources. Typically, the surface layer is light brownish gray loam about 3 inches thick. The subsoil is light brownish gray loam about 12 inches thick. Indurated caliche is at a depth of 15 inches.

Permeability of the Pastura soil is moderate. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

This unit is used for livestock grazing and wildlife habitat.

The potential natural plant community on the Clovis soil is characterized mainly by western wheatgrass, blue grama, galleta, and sideoats grama. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the more desirable forage plants such as western wheatgrass, vine-mesquite, and sideoats grama decrease and blue grama forms a dense, low turf that is low in productivity. Species that are present in the plant community in smaller amounts such as threeawn, ring muhly, buffalograss, and broom snakeweed increase, and cholla invades. This soil receives extra runoff from adjacent areas. Because of this, it is the major forage producing component of the unit.

This soil is suited to rangeland management practices such as installing pipelines for providing water for livestock, providing storage facilities, and rangeland renovation.

The potential natural plant community on the Pastura soil is characterized mainly by blue grama, sideoats grama, and New Mexico feathergrass. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the more desirable forage plant such as sideoats grama and New Mexico feathergrass decrease and there is an increase in wolftail, threeawn, ring muhly, and broom snakeweed, which normally are present only in small amounts in the potential plant community.

Practices that facilitate rangeland management, such as installing pipelines for providing water for livestock, constructing pit tanks, and building fences, are difficult to apply on this soil because of the shallow depth to caliche.

Use of planned grazing systems on this unit that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides a variety of high-quality forage during all seasons of the year. Flexibility in the number of livestock and in the frequency and intensity of grazing is essential to the success of any grazing program.

The average annual production of air-dry vegetation on the Clovis soil ranges from 1,500 pounds per acre in favorable years to 400 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Pastura soil ranges from 1,000 pounds per acre in favorable years to 300 pounds in unfavorable years.

48—Berwolf-Sharvana association, 0 to 3 percent slopes. This map unit is on uplands. Areas are irregular in shape and are 1,000 to 2,000 acres in size. The native vegetation is mainly short grasses. Elevation is 4,400 to 5,000 feet. The average annual precipitation is about 14 to 16 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

This unit is 50 percent Berwolf fine sandy loam, 0 to 3 percent slopes, and 30 percent Sharvana fine sandy loam, 0 to 3 percent slopes. The Berwolf soil is in broad valleys, and the Sharvana soil is on ridges.

Included in this unit are small areas of Friona soils in swales and Roswell soils on dunes. Included areas make up about 20 percent of the total acreage.

The Berwolf soil is deep and well drained. It formed in alluvial and eolian deposits derived dominantly from sandstone and shale. Typically, the surface layer is brown fine sandy loam about 11 inches thick. The subsoil is reddish brown and yellowish red fine sandy loam about 34 inches thick. The substratum to a depth of 60 inches or more is pink fine sandy loam.

Permeability of the Berwolf soil is moderately rapid. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

The Sharvana soil is shallow and well drained. It formed in calcareous loamy alluvium derived from mixed sources. Typically, the surface layer is reddish brown fine sandy loam about 4 inches thick. The subsoil is reddish brown sandy clay loam about 8 inches thick. Indurated caliche is at a depth of 12 inches.

Permeability of the Sharvana soil is moderate. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

This unit is used for livestock grazing and wildlife habitat.

The potential natural plant community on the Berwolf soil is characterized by blue grama, sideoats grama, vine-mesquite, and galleta. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the more desirable forage plants, such as vine-mesquite and sideoats grama decrease and blue grama forms a dense, low turf that is low in productivity. Species that are present in the plant community in smaller amounts such as sand dropseed, threeawn, and ring muhly increase, and mesquite invades.

The potential natural plant community on the Sharvana soil is characterized mainly by black grama, sideoats grama, and blue grama. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the more desirable forage plants such as sideoats grama and black grama decrease and there is an increase in sand dropseed, threeawn, and ring muhly, which normally are present only in small amounts in the potential plant community. Effective livestock distribution is most commonly

accomplished by installing fences and placing salt away from water supplies.

Practices that facilitate rangeland management, such as installing pipelines for providing water for livestock, are difficult to apply on the soil because of the shallow depth to caliche.

This unit is suited to rangeland management practices such as deferred grazing and proper grazing use. Use of planned grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides a variety of high-quality forage during all seasons of the year. Flexibility in the number of livestock and in the frequency and intensity of grazing is essential to the success of any grazing program.

The average annual production of air-dry vegetation on the Berwolf soil ranges from 1,750 pounds per acre in favorable years to 800 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Sharvana soil ranges from 1,200 pounds per acre in favorable years to 450 pounds in unfavorable years.

49—Pojo loamy fine sand, 0 to 5 percent slopes. This moderately deep, well drained soil is on ridges of upland plains (fig. 4). It formed in alluvial and eolian material derived from mixed sources. Areas are elongated in shape and are 250 to 1,000 acres in size. The native vegetation is mainly short grasses. Elevation is 3,900 to 4,300 feet. The average annual precipitation is about 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

Typically, the surface layer is reddish brown loamy fine sand about 9 inches thick. The upper part of the subsoil is reddish brown fine sandy loam about 12 inches thick, and the lower part is light reddish brown fine sandy loam about 4 inches thick. Indurated caliche is at a depth of 25 inches.

Included in this unit are small areas of Kolar soils on high, convex side slopes and Berwolf soils in swales. Included areas make up about 25 percent of the total acreage.

Permeability of this soil is moderately rapid. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is very high.

This unit is used for livestock grazing and wildlife habitat.

The potential natural plant community on the Pojo soil is characterized mainly by sand bluestem, little bluestem, sand sagebrush, and sand dropseed. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the more desirable forage plants such as sand bluestem, little bluestem, indiangrass, and sideoats grama decrease and there is an increase in sand dropseed, threeawn, yucca, and sand sagebrush, which normally are present only in small amounts in the potential plant community.

This soil is suited to rangeland management practices such as proper grazing use and deferred grazing. Practices that facilitate rangeland management, such as building fences and installing pipelines and troughs for providing water for livestock, are suited to the soil. Grazing management that will sustain or increase the vigor, production, and reproduction of the more palatable and productive grasses and shrubs should be implemented. Use of planned grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides a variety of high-quality forage during all seasons of the year. Flexibility in the number of livestock and in the frequency and intensity of grazing is essential to the success of any grazing program. Sufficient residue and litter must be maintained on the soil to reduce soil blowing and damage to young plants.

The average annual production of air-dry vegetation on the Pojo soil ranges from 2,000 pounds per acre in favorable years to 1,100 pounds in unfavorable years.

50—Berwolf-Chispa-Armesa association, 0 to 5 percent slopes. This map unit is on uplands. Areas are irregular in shape and are 200 to 2,500 acres in size. The native vegetation is mainly grass. Elevation is 4,000 to 4,500 feet. The average annual precipitation is about 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

This unit is 55 percent Berwolf loamy fine sand, 0 to 5 percent slopes; 20 percent Chispa fine sandy loam, 0 to 5 percent slopes; and 15 percent Armesa fine sandy loam, 0 to 5 percent slopes. The Berwolf soil is in concave areas, the Chispa soil is on foot slopes and toe slopes, and the Armesa soil is on knobs and ridges.

Included in this unit are small areas of Roswell soils on dunes. Included areas make up about 10 percent of the total acreage.

The Berwolf soil is deep and well drained. It formed in eolian and alluvial material derived dominantly from sandstone and shale. Typically, the surface layer is brown loamy fine sand about 6 inches thick. The upper part of the subsoil is strong brown fine sandy loam about 18 inches thick, and the lower part is reddish yellow fine sandy loam about 12 inches thick. The substratum to a depth of 60 inches or more is light brown sandy loam.

Permeability of the Berwolf soil is moderately rapid. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is very high.

The Chispa soil is deep and well drained. It formed in calcareous alluvium derived dominantly from sandstone and shale. Typically, the surface layer is brown fine sandy loam about 10 inches thick. The subsoil is brown

Figure 4.—Typical vegetation in an area of Pojo loamy fine sand, 0 to 5 percent slopes.

and light brown sandy clay loam about 32 inches thick. The substratum to a depth of 60 inches or more is light reddish brown sandy clay loam.

Permeability of the Chispa soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is nonsaline to slightly saline.

The Armesa soil is deep and well drained. It formed in calcareous alluvium derived dominantly from sandstone and shale. Typically, the surface layer is brown fine sandy loam about 4 inches thick. The subsoil is brown fine sandy loam about 11 inches thick. The substratum to a depth of 60 inches or more is light reddish brown and pink sandy clay loam.

Permeability of the Armesa soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

This unit is used for livestock grazing and wildlife habitat.

The potential natural plant community on the Berwolf soil is characterized mainly by sand bluestem, little bluestem, and sand dropseed. Continuous yearlong grazing generally results in a deteriorated plant

community. As the plant community deteriorates, the more desirable forage plants such as sand bluestem, little bluestem, and indiangrass decrease and there is an increase in sand dropseed, threeawn, and sand sagebrush, which normally are present only in small amounts in the potential plant community. Sufficient residue and litter must be maintained on this soil to reduce soil blowing and damage to young plants. This soil is limited for livestock watering ponds and other water impoundments because of the seepage potential.

The potential natural plant community on the Chispa soil is characterized mainly by blue grama, black grama, sideoats grama, and plains bristlegrass. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the more desirable forage plants such as black grama, sideoats grama, little bluestem, and plains bristlegrass decrease and blue grama forms a dense, low turf that is low in productivity. Species that are present in the plant community in smaller amounts such as threeawn, sand dropseed, muhly, and broom snakeweed increase, and mesquite invades. Areas that are heavily infested with less desirable plants can be improved by chemical or mechanical treatment.

The potential natural plant community on the Armesa soil is characterized mainly by black grama, sideoats grama, and New Mexico feathergrass. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the more desirable forage plants decrease and there is an increase in threeawn, muhly, and broom snakeweed, which normally are present only in small amounts in the potential plant community.

This unit is suited to rangeland management practices such as deferred grazing and proper grazing use. Practices that facilitate rangeland management, such as building fences and constructing pipelines and troughs for supplying water for livestock, are suited to the unit. Grazing management that will sustain or increase the vigor, production, and reproduction of the more palatable and productive grasses and shrubs should be implemented. Use of planned grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides a variety of high-quality forage during all seasons of the year. Flexibility in the number of livestock and in the frequency and intensity of grazing is essential to the success of any grazing program.

The average annual production of air-dry vegetation on the Berwolf soil ranges from 2,000 pounds per acre in favorable years to 1,100 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Chispa soil ranges from 1,600 pounds per acre in favorable years to 800 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Armesa soil ranges from 1,400 pounds per acre in favorable years to 500 pounds in unfavorable years.

51—Regnier-Latom-Rock outcrop complex, 1 to 15 percent slopes. This map unit is on ledges, ridges, and hillslopes (fig. 5). Areas are irregular in shape and are 150 to 1,500 acres in size. The native vegetation is mainly short grasses. Elevation is 3,800 to 5,100 feet. The average annual precipitation is about 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

This unit is 45 percent Regnier clay loam, 3 to 15 percent slopes; 20 percent Latom fine sandy loam, 1 to 15 percent slopes; and 15 percent Rock outcrop. The Regnier soil is on hillslopes, the Latom soil is on ledges, and Rock outcrop is on ridges. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Los Tanos soils in concave areas, Chispa soils on the lower hillslopes, and Hassell soils in nearly level areas. Included areas make up about 20 percent of the total acreage.

The Regnier soil is shallow and well drained. It formed in residuum derived dominantly from shale. Typically, the surface layer is reddish brown clay loam about 9 inches thick. The substratum is reddish brown clay loam about 9 inches thick. Shale is at a depth of 18 inches.

Permeability of the Regnier soil is moderately slow. Available water capacity is very low. Effective rooting depth is 12 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

The Latom soil is very shallow and shallow and is well drained. It formed in residuum derived dominantly from sandstone. Typically, the surface layer is pale brown fine sandy loam about 7 inches thick. Sandstone is at a depth of 7 inches.

Permeability of the Latom soil is moderately rapid. Available water capacity is very low. Effective rooting depth is 7 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

Rock outcrop consists of sandstone and shale. It supports little if any vegetation.

This unit is used for livestock grazing and wildlife habitat.

The potential natural plant community on the Regnier soil is characterized mainly by sideoats grama, tobosa, and blue grama. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the more desirable forage plants such as sideoats grama decrease and there is an increase in threeawn and broom snakeweed, which normally are present only in small amounts in the potential plant community. Mesquite readily invades this soil. Areas that are heavily infested with less desirable plants can be improved by chemical or mechanical treatment.

Figure 5.—Typical area of Regnier-Latom-Rock outcrop complex, 1 to 15 percent slopes.

This soil is suited to rangeland management practices such as deferred grazing and proper grazing use. Effective livestock distribution is most commonly accomplished by building fences and placing salt away from water supplies. Practices that facilitate rangeland management, such as installing pipelines for providing water for livestock and constructing pit tanks and ponds, are difficult to apply on this soil because of the shallow depth to shale.

The potential natural plant community on the Latom soil is characterized mainly by little bluestem, sideoats grama, black grama, and New Mexico feathergrass. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the more desirable forage plants decrease and there is an increase in hairy grama, sacahuista, wolftail, and juniper, which normally are present only in small amounts in the potential plant community.

This soil is suited to rangeland management practices such as deferred grazing and proper grazing use. Effective livestock distribution is most commonly accomplished by placing salt away from water supplies. This soil has limited suitability for rangeland management practices such as building fences and installing pipelines

for providing water for livestock because of the very shallow and shallow depth to sandstone.

Grazing management that will sustain or increase the vigor, production, and reproduction of the more palatable and productive grasses and shrubs should be implemented on this unit. Use of planned grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides a variety of high-quality forage during all seasons of the year. Flexibility in the number of livestock and in the frequency and intensity of grazing is essential to the success of any grazing program.

The average annual production of air-dry vegetation on the Regnier soil ranges from 1,500 pounds per acre in favorable years to 500 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Latom soil ranges from 1,200 pounds per acre in favorable years to 400 pounds in unfavorable years.

52—Latom-Berwolf association, 0 to 10 percent slopes. This map unit is on hillslopes and in small valleys. Areas are irregular in shape and are 200 to 1,000 acres in size. The native vegetation is mainly short and mid grasses (fig. 6). Elevation is 4,000 to 4,800 feet. The average annual precipitation is about 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

This unit is 50 percent Latom loamy fine sand, 0 to 10 percent slopes, and 35 percent Berwolf loamy fine sand, 0 to 5 percent slopes. The Latom soil is on ridges and back slopes, and the Berwolf soil is on foot slopes and in small valleys.

Included in this unit are small areas of Rock outcrop on ledges and Roswell soils on dunes. Included areas make up about 15 percent of the total acreage.

The Latom soil is very shallow and shallow and is well drained. It formed in residuum derived dominantly from sandstone. Typically, the surface layer is reddish brown loamy fine sand about 3 inches thick. The underlying layer is yellowish red fine sandy loam about 4 inches thick. Sandstone is at a depth of 7 inches.

Permeability of the Latom soil is moderate. Available water capacity is very low. Effective rooting depth is 7 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is very high.

The Berwolf soil is deep and well drained. It formed in eolian and alluvial deposits derived dominantly from sandstone and shale. Typically, the surface layer is light reddish brown loamy fine sand about 16 inches thick. The subsoil is reddish brown fine sandy loam about 17 inches thick. The substratum to a depth of 60 inches or more is reddish brown fine sandy loam.

Permeability of the Berwolf soil is moderately rapid. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is very high.

This unit is used for livestock grazing and wildlife habitat.

The potential natural plant community on the Latom soil is characterized mainly by little bluestem, sideoats grama, New Mexico feathergrass, and blue grama. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the more desirable forage plants such as little bluestem and sideoats grama decrease and there is an increase in hairy grama, sacahuista, threeawn, and broom snakeweed, which normally are present only in small amounts in the potential plant community.

The Latom soil is suited to rangeland management practices such as deferred grazing and proper grazing use. Effective livestock distribution is most commonly accomplished by placing salt away from water supplies. This soil has limited suitability for rangeland management practices such as building fences and installing pipelines for providing water for livestock because of the very shallow and shallow depth to sandstone.

The potential natural plant community on the Berwolf soil is characterized mainly by sand bluestem, little bluestem, sand dropseed, and sand sagebrush. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the more desirable forage plants such as sand bluestem, little bluestem, indiangrass, and sideoats grama decrease and there is an increase in sand dropseed, threeawn, yucca, and sand sagebrush, which normally are present only in small amounts in the potential plant community. Sufficient residue and litter must be maintained on the Berwolf soil to reduce soil blowing and damage to young plants.

The Berwolf soil is suited to rangeland management practices such as deferred grazing and proper grazing use. Effective livestock distribution is most commonly accomplished by fencing, installing pipelines for providing water for livestock, constructing water storage facilities, and placing salt away from sources of water. This soil is limited for livestock watering ponds and other water impoundments because of the seepage potential.

Grazing management that will sustain or increase the vigor, production, and reproduction of the more palatable and productive grasses and shrubs on this unit. Use of planned grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides a variety of high-quality forage during all seasons of the year. Flexibility in the number of livestock and in the frequency and intensity of grazing is essential to the success of any grazing program.

The average annual production of air-dry vegetation on the Latom soil ranges from 1,200 pounds per acre in favorable years to 400 pounds in unfavorable years.

Figure 6.—Sacahuista in an area of Latom-Berwolf association, 0 to 10 percent slopes.

The average annual production of air-dry vegetation on the Berwolf soil ranges from 2,000 pounds per acre in favorable years to 1,100 pounds in unfavorable years.

53—Cardenas loamy fine sand, 1 to 15 percent slopes. This shallow, well drained soil is on hills and ridges. It formed in alluvium that has been reworked by wind and is derived from mixed sources. Areas are irregular in shape and are 50 to 1,000 acres in size. The native vegetation is mainly short grasses. Elevation is 5,000 to 5,400 feet. The average annual precipitation is about 12 to 14 inches, the average annual air temperature is 55 to 57 degrees F, and the average frost-free period is 160 to 180 days.

Typically, the surface layer is light brown loamy fine sand about 3 inches thick. The subsoil is light brown and brown fine sandy loam about 11 inches thick. Indurated caliche is at a depth of 14 inches.

Included in this unit are small areas of deep, loamy soils in depressional areas on dunes and in eroded areas. Included areas make up about 25 percent of the total acreage.

Permeability of this soil is moderately rapid. Available water capacity is very low. Effective rooting depth is 10

to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is very high.

This unit is used for livestock grazing and wildlife habitat.

The potential natural plant community on the Cardenas soil is characterized mainly by black grama, hairy grama, sideoats grama, and New Mexico feathergrass. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the more desirable forage plants such as black grama, sideoats grama, New Mexico feathergrass, and little bluestem decrease and there is an increase in wolftail, threeawn, muhly, and broom snakeweed, which normally are present only in small amounts in the potential plant community. Sufficient residue and litter must be maintained on this soil to reduce soil blowing and damage to young plants.

This soil is suited to rangeland management practices such as deferred grazing and proper grazing use. Effective livestock distribution is most commonly accomplished by building fences and placing salt away from water supplies. Practices that facilitate rangeland management, such as installing livestock water pipelines and constructing pit tanks and ponds, are difficult to apply on this soil because of the shallow depth to indurated caliche. Grazing management that will sustain or increase the vigor, production, and reproduction of the more palatable and productive grasses and shrubs should be implemented. Use of planned grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides a variety of high-quality forage during all seasons of the year. Flexibility in the number of livestock and in the frequency and intensity of grazing is essential to the success of any grazing program.

The average annual production of air-dry vegetation on the Cardenas soil ranges from 1,400 pounds per acre in favorable years to 450 pounds in unfavorable years.

55—Darvey loam, 0 to 5 percent slopes. This deep, well drained soil is on uplands. It formed in calcareous alluvium derived dominantly from limestone. Areas are irregular in shape and are 200 to 2,000 acres in size. The native vegetation is mainly short grasses. Elevation is 4,800 to 5,400 feet. The average annual precipitation is about 12 to 14 inches, the average annual air temperature is 55 to 57 degrees F, and the average frost-free period is 160 to 180 days.

Typically, the surface layer is brown loam about 6 inches thick. The upper part of the subsoil is brown and light brown loam about 22 inches thick, and the lower part is pinkish white clay loam about 7 inches thick. The substratum to a depth of 60 inches or more is pink clay loam.

Included in this unit are small areas of soils that have a darker colored surface layer and are in concave areas and small areas of soils that are similar to this Darvey soil but have a layer of lime accumulation nearer the surface and are in convex areas. Included areas make up about 25 percent of the total acreage.

Permeability of this Darvey soil is moderate. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

This unit is used for livestock grazing and wildlife habitat.

The potential natural plant community on the Darvey soil is characterized mainly by blue grama, galleta, sideoats grama, and vine-mesquite. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the more desirable forage plants such as sideoats grama and vine-mesquite decrease and blue grama forms a dense, low turf that is low in productivity. Species that are present in the plant community in smaller amounts such as threeawn, ring muhly, buffalograss, and broom snakeweed increase, and walkingstick cholla invades. Areas that are heavily infested with less desirable plants can be improved by chemical or mechanical treatment.

This soil is suited to rangeland management practices such as installing pipelines for providing water for livestock, constructing water storage facilities, and building fences. It is also suited to management practices such as proper grazing use and deferred grazing. Grazing management that will sustain or increase the vigor, production, and reproduction of the more palatable and productive grasses and shrubs should be implemented. Use of planned grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides a variety of high-quality forage during all seasons of the year. Flexibility in the number of livestock and in the frequency and intensity of grazing is essential to the success of any grazing program.

The average annual production of air-dry vegetation on the Darvey soil ranges from 1,600 pounds per acre in favorable years to 700 pounds in unfavorable years.

56—Tucumcari-Hassell clay loams, 0 to 5 percent slopes. This map unit is in broad valleys and on adjacent hillslopes. Areas are irregular in shape and are 200 to 800 acres in size. The native vegetation is mainly short grasses. Elevation is 4,000 to 4,500 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

This unit is 60 percent Tucumcari clay loam, 0 to 5 percent slopes, and 30 percent Hassell clay loam, 0 to 5 percent slopes. The Tucumcari soil is in valleys, and the Hassell soil is on hillslopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Montoya soils in depressional areas and Regnier soils on back slopes. Included areas make up about 10 percent of the total acreage.

The Tucumcari soil is deep and well drained. It formed in alluvium derived dominantly from red-bed shale and sandstone. Typically, the surface layer is dark reddish brown clay loam about 8 inches thick. The subsoil is dark red clay loam about 28 inches thick. The substratum to a depth of 60 inches or more is dark red clay.

Permeability of the Tucumcari soil is moderately slow. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The Hassell soil is moderately deep and well drained. It formed in residuum derived dominantly from shale. Typically, the surface layer is red clay loam about 5 inches thick. The upper part of the subsoil is light reddish brown clay loam about 4 inches thick, and the lower part is reddish brown clay about 23 inches thick. Weathered shale is at a depth of 32 inches.

Permeability of the Hassell soil is slow. Available water capacity is moderate. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

This unit is used for livestock grazing and wildlife habitat.

The potential natural plant community on this unit is characterized mainly by blue grama, alkali sacaton, and tobosa. As the plant community deteriorates, the more desirable forage plants such as vine-mesquite and sideoats grama decrease and there is an increase in broom snakeweed and burrograss, which normally are present only in small amounts in the potential natural plant community. Mesquite and walkingstick cholla may invade. Areas that are heavily infested with less desirable plants can be improved by chemical or mechanical treatment (fig. 7).

Practices that facilitate rangeland management, such as building fences and installing pipelines and troughs for supplying water for livestock, are suited to this unit. Earthen ponds are suited to the Tucumcari soil. Grazing management that will sustain or increase the vigor, production, and reproduction of the more palatable and productive grasses and shrubs should be implemented. Use of planned grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides a variety of high-quality forage during all seasons of the year. Flexibility in the number of livestock and in the frequency and intensity of grazing is essential to the success of any grazing program.

The average annual production of air-dry vegetation on this unit ranges from 1,500 pounds per acre in favorable years to 500 pounds in unfavorable years.

57—Latom-Rock outcrop complex, 3 to 20 percent slopes. This map unit is on hillslopes and breaks (fig. 8). Areas are irregular in shape and are 300 to 800 acres in size. The native vegetation is mainly short grasses. Elevation is 3,800 to 5,100 feet. The average annual precipitation is about 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

This unit is 55 percent Latom fine sandy loam, 3 to 20 percent slopes, and 35 percent Rock outcrop. The Latom soil is on the lower hillslopes and on ledges, and the Rock outcrop is on breaks. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Hassell soils in nearly level areas, Los Tanos soils in concave areas, and Regnier soils on the upper hillslopes. Included areas make up about 10 percent of the total acreage.

The Latom soil is very shallow and shallow and is well drained. It formed in residuum derived dominantly from sandstone. Typically, the surface layer is reddish brown fine sandy loam about 7 inches thick. Sandstone is at a depth of 7 inches.

Permeability of the Latom soil is moderate. Available water capacity is very low. Effective rooting depth is 7 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

Rock outcrop is grayish brown shale, sandstone, and conglomerate. It supports little if any vegetation.

This unit is used for livestock grazing and wildlife habitat.

The potential natural plant community on the Latom soil is characterized mainly by black grama, New Mexico feathergrass, little bluestem, and sideoats grama. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the more desirable forage plants such as black grama and New Mexico feathergrass decrease and there is an increase in wolftail and threeawn, which normally are present only in small amounts in the potential plant community. Grazing management should be designed to increase the productivity and reproduction of black grama and sideoats grama. Effective livestock distribution is most commonly accomplished by placing salt away from water supplies.

Practices that facilitate rangeland management, such as building fences and constructing pipelines for providing water for livestock, are difficult to apply on this unit because of the very shallow and shallow depth to sandstone. This unit is not suited to the construction of ponds because of the very shallow and shallow depth to sandstone.

Grazing management that will sustain or increase the vigor, production, and reproduction of the more palatable and productive grasses and shrubs should be implemented. Use of planned grazing systems that vary the seasons of grazing and rest during successive years

Figure 7.—Typical area of Tumcumcari-Hassell clay loams, 0 to 5 percent slopes. On surface is mesquite that has been dug out.

promotes a balanced plant community that provides a variety of high-quality forage during all seasons of the year. Flexibility in the number of livestock and in the frequency and intensity of grazing is essential to the success of any grazing program.

The average annual production of air-dry vegetation on this unit ranges from 1,200 pounds per acre in favorable years to 400 pounds in unfavorable years.

58—Redona-Armesa association, 0 to 5 percent slopes. This map unit is on uplands. Areas are irregular in shape and are 100 to 2,000 acres in size. The native vegetation is mainly short grasses. Elevation is 3,800 to 5,000 feet. The average annual precipitation is about 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

This unit is 50 percent Redona sandy clay loam, 0 to 5 percent slopes, and 25 percent Armesa sandy clay loam, 0 to 5 percent slopes. The Redona soil is in broad swales, and the Armesa soil is on ridges and the higher hillslopes.

Included in this unit are small areas of Kolar soils on ridges, Tucumcari soils in swales, and Chispa soils on

Figure 8.—Typical area of Latom-Rock outcrop complex, 3 to 20 percent slopes.

the lower side slopes. Included areas make up about 25 percent of the total acreage.

The Redona soil is deep and well drained. It formed in alluvium derived dominantly from sandstone and shale. Typically, the surface layer is dark reddish brown sandy clay loam about 6 inches thick. The upper part of the subsoil is reddish brown sandy clay loam about 10 inches thick, and the lower part is light reddish brown sandy clay loam about 26 inches thick. The substratum to a depth of 60 inches or more is light reddish brown sandy clay loam.

Permeability of the Redona soil is moderate. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

The Armesa soil is deep and well drained. It formed in calcareous alluvium derived dominantly from sandstone and shale. Typically, the surface layer is dark brown sandy clay loam about 2 inches thick. The subsoil is dark brown sandy clay loam about 5 inches thick. The substratum to a depth of 60 inches or more is pink sandy clay loam.

Permeability of the Armesa soil is moderate. Available water capacity is high. Effective rooting depth is 60

inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

This unit is used for livestock grazing and wildlife habitat.

The potential natural plant community on the Redona soil is characterized mainly by blue grama, tobosa, and sideoats grama. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the more desirable forage plants such as black grama and sideoats grama decrease and there is an increase in buffalograss, threeawn, and broom snakeweed, which normally are present only in small amounts in the potential plant community. Mesquite readily invades this soil. Areas that are heavily infested with less desirable plants can be improved by chemical or mechanical treatment. Grazing management should be designed to increase the productivity and reproduction of blue grama and black grama. The seasonal suitability of some plants in the plant community for use as forage should be considered.

The potential natural plant community on the Armesa soil is characterized mainly by blue grama, sideoats grama, black grama, and New Mexico feathergrass. If the plant community deteriorates, New Mexico feathergrass and black grama decrease and there is an increase in threeawn and wolftail, which normally are present only in small amounts in the potential natural plant community.

Practices that facilitate rangeland management, such as building fences and installing pipelines, troughs, and earthen ponds for supplying water for livestock, are suited to this unit. Grazing management that will sustain or increase the vigor, production, and reproduction of the more palatable and productive grasses and shrubs should be implemented. Use of planned grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides a variety of high-quality forage during all seasons of the year. Flexibility in the number of livestock and in the frequency and intensity of grazing is essential to the success of any grazing program.

The average annual production of air-dry vegetation on the Redona soil ranges from 1,600 pounds per acre in favorable years to 700 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Armesa soil ranges from 1,400 pounds per acre in favorable years to 500 pounds in unfavorable years.

59—Chispa-Los Tanos fine sandy loams, 0 to 5 percent slopes. This map unit is on uplands. Areas are irregular in shape and are 200 to 1,000 acres in size. The native vegetation is mainly short grasses. Elevation is 4,000 to 5,200 feet. The average annual precipitation is about 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

This unit is 50 percent Chispa fine sandy loam, 0 to 5 percent slopes, and 30 percent Los Tanos fine sandy loam, 0 to 5 percent slopes. The Chispa soil is on foot slopes, and the Los Tanos soil is on ridges and back slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Latom soils on ridges, Rock outcrop on high ridges, Redona soil in swales, and Hassell soils in nearly level areas. Included areas make up about 20 percent of the total acreage.

The Chispa soil is deep and well drained. It formed in calcareous alluvium derived dominantly from sandstone and shale. Typically, the surface layer is reddish brown fine sandy loam about 4 inches thick. The subsoil is reddish brown sandy clay loam about 19 inches thick. The substratum to a depth of 60 inches or more is light reddish brown to pink sandy loam.

Permeability of the Chispa soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is nonsaline to slightly saline.

The Los Tanos soil is moderately deep and well drained. It formed in residuum derived dominantly from sandstone. Typically, the surface layer is reddish brown fine sandy loam about 8 inches thick. The subsoil is reddish brown to yellowish red fine sandy loam about 26 inches thick. Sandstone is at a depth of 34 inches.

Permeability of the Los Tanos soil is moderately rapid. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

This unit is used for livestock grazing and wildlife habitat.

The potential natural plant community on this unit is characterized by blue grama, black grama, sideoats grama, and little bluestem. As the plant community deteriorates, the more desirable forage plants such as black grama and sideoats grama decrease and blue grama forms a dense, low turf that is low in productivity. Species that are present in the plant community in smaller amounts such as buffalograss, broom snakeweed, and threeawn increase, and mesquite invades. Areas that are heavily infested with less desirable plants can be improved by chemical or mechanical treatment.

Practices that facilitate rangeland management, such as building fences and installing pipelines and troughs for supplying water for livestock, are suited to this unit. Effective livestock distribution is most commonly accomplished by the use of pipelines for providing water for livestock and placing salt away from water supplies. Grazing management that will sustain or increase the vigor, production, and reproduction of the more palatable and productive grasses and shrubs should be implemented. Use of planned grazing systems that vary

the seasons of grazing and rest during successive years promotes a balanced plant community that provides a variety of high-quality forage during all seasons of the year. Flexibility in the number of livestock and in the frequency and intensity of grazing is essential to the success of any grazing program.

The average annual production of air-dry vegetation on this unit ranges from 1,600 pounds per acre in favorable years to 800 pounds in unfavorable years.

60—Chispa-Armesa-Redona association, 2 to 7 percent slopes. This map unit is on uplands. Areas are irregular in shape and are 200 to 2,000 acres in size. The native vegetation is mainly short grasses. Elevation is 3,800 to 5,000 feet. The average annual precipitation is about 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

This unit is 35 percent Chispa fine sandy loam, 2 to 5 percent slopes; 25 percent Armesa fine sandy loam, 2 to 7 percent slopes; and 20 percent Redona fine sandy loam, 2 to 5 percent slopes. The Chispa soil is on foot slopes, the Armesa soil is on back slopes, and the Redona soil is in concave areas.

Included in this unit are small areas of Kolar and Neso soils on high ridges. In some areas are soils that are similar to the soils in this unit but have less clay in the subsoil. Included areas make up about 20 percent of the total acreage.

The Chispa soil is deep and well drained. It formed in calcareous alluvium derived dominantly from sandstone and shale. Typically, the surface layer is brown fine sandy loam about 7 inches thick. The upper part of the subsoil is reddish brown sandy clay loam about 14 inches thick, and the lower part is yellowish red sandy clay loam about 11 inches thick. The substratum to a depth of 60 inches or more is pink sandy clay loam.

Permeability of the Chispa soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is nonsaline to slightly saline.

The Armesa soil is deep and well drained. It formed in calcareous alluvium derived dominantly from shale and sandstone. Typically, the surface layer is brown fine sandy loam about 4 inches thick. The subsoil is light reddish brown fine sandy loam about 6 inches thick. The upper part of the substratum is pinkish white sandy clay loam about 23 inches thick, and the lower part to a depth of 60 inches or more is pink fine sandy loam.

Permeability of the Armesa soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The Redona soil is deep and well drained. It formed in alluvium derived dominantly from sandstone and shale. Typically, the surface layer is brown fine sandy loam about 6 inches thick. The subsoil is reddish brown and red sandy clay loam about 21 inches thick. The substratum to a depth of 60 inches or more is light red sandy clay loam.

Permeability of the Redona soil is moderate. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

This unit is used for livestock grazing and wildlife habitat.

The potential natural plant community on the Chispa and Redona soils is characterized mainly by blue grama, black grama, and sideoats grama. Continuous yearlong grazing results in a deteriorated plant community. As the plant community deteriorates, the more desirable forage plants such as black grama and sideoats grama decrease and blue grama forms a dense, low turf that is low in productivity. Species that are present in the plant community in smaller amounts, such as threeawn, buffalograss, and broom snakeweed increase, and mesquite invades. Grazing management should be designed to increase the productivity and reproduction of blue grama and black grama.

The potential natural plant community on the Armesa soil is characterized mainly by blue grama, black grama, sideoats grama, and New Mexico feathergrass. As the plant community deteriorates, the more desirable forage plants decrease and there is an increase in threeawn, blue grama, and wolftail, which normally are present only in small amounts in the potential plant community.

Practices that facilitate rangeland management, such as building fences and installing pipelines and troughs for supplying water for livestock, are suited to this unit. Areas that are heavily infested with less desirable plants can be improved by chemical or mechanical treatment. Effective livestock distribution is most commonly accomplished by the use of livestock water developments and placing salt away from sources of water supplies. Grazing management that will sustain or increase the vigor, production, and reproduction of the more palatable and productive grasses and shrubs should be implemented. Use of planned grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides a variety of high-quality forage during all seasons of the year. Flexibility in the number of livestock and in the frequency and intensity of grazing is essential to the success of any grazing program.

The average annual production of air-dry vegetation on the Chispa and Redona soils ranges from 1,600 pounds per acre in favorable years to 800 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Armesa soil ranges from 1,400 pounds per acre in favorable years to 500 pounds in unfavorable years.

61—Berwolf-Roswell association, 1 to 15 percent slopes. This map unit is on uplands. Areas are elongated and irregular in shape and are 300 to 1,000 acres in size. The native vegetation is mainly short and mid grasses. Elevation is 3,800 to 4,800 feet. The average annual precipitation is about 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

This unit is 60 percent Berwolf loamy fine sand, 1 to 5 percent slopes, and 20 percent Roswell fine sand, 5 to 15 percent slopes. The Berwolf soil is in the nearly level areas, and the Roswell soil is on dunes.

Included in this unit are small areas of Kolar and Pojo soils on some ridges. In some places along the Chaves County boundary are soils that are similar to the Berwolf soil but have less clay in the subsoil and have a calcareous surface layer and soils that are similar to the Roswell soil but are moist for a longer period. Included areas make up about 20 percent of the total acreage.

The Berwolf soil is deep and well drained. It formed in eolian and alluvial deposits derived dominantly from sandstone and shale. Typically, the surface layer is brown loamy fine sand about 11 inches thick. The upper part of the subsoil is yellowish red sandy loam about 5 inches thick, and the lower part is red and yellowish red sandy loam about 26 inches thick. The substratum to a depth of 60 inches or more is pink fine sandy loam.

Permeability of the Berwolf soil is moderately rapid. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is very high.

The Roswell soil is deep and excessively drained. It formed in eolian material derived dominantly from sandstone and shale. Typically, the surface layer is brown fine sand about 8 inches thick. The substratum to a depth of 60 inches or more is light reddish brown fine sand.

Permeability of the Roswell soil is rapid. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is very high.

This unit is used for livestock grazing and wildlife habitat.

The potential natural plant community on this unit is characterized by sand bluestem, little bluestem, and sand dropseed. Continuous yearlong grazing generally results in a deteriorated plant community. If the plant community deteriorates, sand dropseed and sand bluestem decrease and there is an increase in threeawn, small soapweed, yucca, and sand sagebrush, which normally are present only in small amounts in the potential natural plant community.

This unit is suited to rangeland management practices such as building fences and installing pipelines and troughs for providing water for livestock. Effective livestock distribution is most commonly accomplished by the use of fences and planned grazing systems. Grazing management that will sustain or increase the vigor, production, and reproduction of the more palatable and productive grasses and shrubs should be implemented. Use of planned grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides a variety of high-quality forage during all seasons of the year. Flexibility in the number of livestock and in the frequency and intensity of grazing is essential to the success of any grazing program.

The average annual production of air-dry vegetation on the Berwolf soil ranges from 3,000 pounds per acre in favorable years to 1,400 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Roswell soil ranges from 2,500 pounds per acre in favorable years to 1,100 pounds in unfavorable years.

62—Regnier-Latom-Rock outcrop complex, 15 to 35 percent slopes. This map unit is on hillslopes (fig. 9). Areas are irregular in shape and are 250 to 1,500 acres in size. The native vegetation is mainly short grasses. Elevation is 3,800 to 5,000 feet. The average annual precipitation is about 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the frost-free period is 180 to 200 days.

This unit is 50 percent Regnier clay loam, 15 to 35 percent slopes; 15 percent Latom gravelly fine sandy loam, 15 to 20 percent slopes; and 15 percent Rock outcrop, 15 to 35 percent slopes. The Regnier soil is on foot slopes, the Latom soil is on benches and ledges, and Rock outcrop is on back slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Redona and Chispa soils in the lower lying areas. Included areas make up about 20 percent of the total acreage.

The Regnier soil is shallow and well drained. It formed in residuum derived dominantly from shale. Typically, the surface layer is reddish brown clay loam about 2 inches thick. Below this to a depth of 17 inches is reddish brown clay loam. Weathered shale is at a depth of 17 inches.

Permeability of the Regnier soil is moderately slow. Available water capacity is very low. Effective rooting depth is 12 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

The Latom soil is very shallow and shallow and is well drained. It formed in residuum derived dominantly from sandstone. Typically, the surface layer is reddish brown gravelly fine sandy loam about 9 inches thick. Sandstone is at a depth of 9 inches.

Permeability of the Latom soil is moderate. Available water capacity is very low. Effective rooting depth is 7 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

Figure 9.—Typical area of Regnier-Latom-Rock outcrop complex, 15 to 35 percent slopes.

Rock outcrop consists of sandstone and shale. It supports little if any vegetation.

This unit is used for livestock grazing and wildlife habitat.

The potential natural plant community on the Regnier soil is characterized mainly by sideoats grama, tobosa, and blue grama. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the more desirable forage plants such as sideoats grama decrease and there is an increase in threeawn and broom snakeweed, which normally are present only in small amounts in the potential plant community.

The potential natural plant community on the Latom soil is characterized mainly by black grama, blue grama, sideoats grama, and little bluestem. If the plant community deteriorates, black grama, little bluestem, and sideoats grama decrease and there is an increase in threeawn, broom snakeweed, juniper, and sacahuista, which normally are present only in small amounts in the potential natural plant community.

Practices that facilitate rangeland management, such as fencing and installing livestock water developments are difficult to apply on this unit because of the very

shallow and shallow depth of the soils and the steepness of slope.

The average annual production of air-dry vegetation on the Regnier soil ranges from 1,000 pounds per acre in favorable years to 500 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Latom soil ranges from 1,100 pounds per acre in favorable years to 500 pounds in unfavorable years.

63—Neso-Kolar association, 0 to 5 percent slopes. This map unit is on knobs and ridges and in slightly concave areas on mesa summits. Areas are irregular in shape and are 100 to 1,500 acres in size. The native vegetation is mainly grass. Elevation is 4,400 to 5,000 feet. The average annual precipitation is about 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

This unit is 70 percent Neso very gravelly fine sandy loam, 0 to 5 percent slopes, and 20 percent Kolar fine sandy loam, 0 to 5 percent slopes. The Neso soil is on knobs and ridges, and the Kolar soil is in slightly concave areas.

Included in this unit are small areas of Berwolf and Redona soils in small swales and some other concave areas, Pojo soils in concave areas, and Rock outcrop near breaks. Included areas make up about 10 percent of the total acreage.

The Neso soil is very shallow and shallow and is well drained. It formed in hard caliche and loamy material derived from mixed sources. Typically, the surface layer is brown very gravelly fine sandy loam about 6 inches thick. The underlying material is light brown very cobbly fine sandy loam about 6 inches thick. Indurated caliche is at a depth of 12 inches.

Permeability of the Neso soil is moderately rapid. Available water capacity is very low. Effective rooting depth is 8 to 14 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

The Kolar soil is very shallow and shallow and is well drained. It formed in calcareous alluvium derived from mixed sources. Typically, the surface layer is yellowish brown fine sandy loam about 9 inches thick. The underlying material is brown fine sandy loam about 5 inches thick. Indurated caliche is at a depth of 14 inches.

Permeability of the Kolar soil is moderately rapid. Available water capacity is very low. Effective rooting depth is 9 to 20 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

This unit is used for livestock grazing and wildlife habitat.

The potential natural plant community on the Neso soil is characterized mainly by black grama, hairy grama, New Mexico feathergrass, and bottlebrush squirreltail. Continuous yearlong grazing generally results in a deteriorated plant community, generally of less value for grazing. This soil is highly susceptible to damage by yearlong grazing because of the very low available water capacity. As the plant community deteriorates, the more desirable forage plants decrease and there is an increase in wolftail, broom snakeweed, and muhly, which normally are present only in small amounts in the potential plant community.

The potential natural plant community on the Kolar soil is characterized mainly by hairy grama, black grama, sideoats grama, sand dropseed, and little bluestem. If the plant community deteriorates, hairy grama, black grama, and New Mexico feathergrass decrease and there is an increase in threeawn, yucca, wolftail, and broom snakeweed. Grazing management should be designed to increase the productivity and reproduction of black grama and hairy grama.

Practices that facilitate rangeland management, such as installing fences and pipelines for providing water for livestock, are difficult to apply on this unit because of the very shallow and shallow depth to indurated caliche. Effective livestock distribution is most commonly accomplished by placing salt away from water supplies. Grazing management that will sustain or increase the vigor, production, and reproduction of the more palatable and productive grasses and shrubs should be implemented. Use of planned grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides a variety of high-quality forage during all seasons of the year. Flexibility in the number of livestock and in the frequency and intensity of grazing is essential to the success of any grazing program.

The average annual production of air-dry vegetation on the Neso soil ranges from 900 pounds per acre in favorable years to 300 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Kolar soil ranges from 1,400 pounds per acre in favorable years to 450 pounds in unfavorable years.

64—Berwolf fine sandy loam, 0 to 5 percent slopes. This deep, well drained soil is on uplands. It formed in eolian material and alluvial deposits derived dominantly from sandstone and shale. Areas are irregular in shape and are 300 to 2,000 acres in size. The native vegetation is mainly short grasses. Elevation is 4,000 to 5,000 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

Typically, the surface layer is reddish brown fine sandy loam about 7 inches thick. The upper part of the subsoil is light reddish brown fine sandy loam about 13 inches thick, and the lower part is light brown fine sandy loam about 19 inches thick. The substratum to a depth of 60 inches or more is pink fine sandy loam.

Included in this unit are small areas of Redona soils in swales and Chispa soils on side slopes. Included areas make up about 20 percent of the total acreage.

Permeability of this Berwolf soil is moderately rapid. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

This unit is used for livestock grazing and wildlife habitat.

The potential natural plant community on this unit is characterized by blue grama, black grama, sideoats grama, and little bluestem. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the more desirable forage plants such as black grama, sideoats grama, and little bluestem decrease and blue grama forms a dense, low turf that is low in productivity. Species that are present in the plant community in smaller amounts, such as threeawn and buffalograss increase, and mesquite invades.

Practices that facilitate rangeland management, such as fencing and installing pipelines and troughs for providing water for livestock, are suited to this unit. Ponds and pit tanks have limited suitability because of the seepage potential. Range management practices such as proper grazing use, planned grazing systems, and deferred grazing are suited to the soil. Grazing management that will sustain or increase the vigor, production, and reproduction of the more palatable and productive grasses and shrubs should be implemented. Use of planned grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides a variety of high-quality forage during all seasons of the year. Flexibility in the number of livestock and in the frequency and intensity of grazing is essential to the success of any grazing program.

The average annual production of air-dry vegetation on this unit ranges from 1,600 pounds per acre in favorable years to 800 pounds in unfavorable years.

66—Pojo-Kolar loamy fine sands, 0 to 5 percent slopes. This map unit is on mesas and ridges. Areas are elongated in shape and are 100 to 1,000 acres in size. The native vegetation is mainly short and mid grasses. Elevation is 4,300 to 5,000 feet. The average annual precipitation is about 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

This unit is 65 percent Pojo loamy fine sand, 0 to 5 percent slopes, and 20 percent Kolar loamy fine sand, 0 to 5 percent slopes. The Pojo soil is in concave areas, and the Kolar soil is in convex areas. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Berwolf soils in swales, Roswell soils on sand dunes, and Neso soils on knobs. Included areas make up about 15 percent of the total acreage.

The Pojo soil is moderately deep and well drained. It formed in eolian and alluvial deposits derived from mixed sources. Typically, the surface layer is brown loamy fine sand about 5 inches thick. The subsoil is reddish brown fine sandy loam about 24 inches thick. Indurated caliche is at a depth of 29 inches.

Permeability of the Pojo soil is moderately rapid. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is very high.

The Kolar soil is shallow and well drained. It formed in calcareous alluvial and eolian material derived from mixed sources. Typically, the surface layer is brown loamy fine sand about 6 inches thick. The subsoil is reddish brown fine sandy loam about 9 inches thick. Indurated caliche is at a depth of 15 inches.

Permeability of the Kolar soil is moderately rapid. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is very high.

This unit is used for livestock grazing and wildlife habitat.

The potential natural plant community on the Pojo soil is characterized mainly by little bluestem, sand bluestem, New Mexico feathergrass, and sand dropseed. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the more desirable forage plants decrease and there is an increase in wolftail, threeawn, and field sandbur, which normally are present only in small amounts in the potential plant community.

The potential natural plant community on the Kolar soil is characterized mainly by black grama, sideoats grama, hairy grama, New Mexico feathergrass, and feather dalea. As the plant community deteriorates, the more desirable forage plants such as New Mexico feathergrass and black grama decrease and there is an increase in blue grama, threeawn, and sand dropseed, which normally are present only in small amounts in the potential plant community.

Practices that facilitate rangeland management, such as installing pipelines for providing water for livestock, are difficult to apply on the Kolar soil because of the shallow depth to caliche.

Sufficient residue and litter must be maintained on this unit to reduce soil blowing and damage to young plants. The unit is suited to rangeland management practices such as proper grazing use and deferred grazing. Use of planned grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides a variety of high-quality forage during all seasons of the year. Flexibility in the number of livestock and in the frequency

and intensity of grazing is essential to the success of any grazing program.

The average annual production of air-dry vegetation on the Pojo soil ranges from 1,500 pounds per acre in favorable years to 500 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Kolar soil ranges from 1,400 pounds per acre in favorable years to 450 pounds in unfavorable years.

67—Kolar-Neso-Pojo complex, 0 to 5 percent slopes. This map unit is on mesas (fig. 10). Areas are irregular in shape and are 50 to 1,000 acres in size. The native vegetation is mainly short grasses. Elevation is 4,300 to 5,200 feet. The average annual precipitation is about 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

This unit is 50 percent Kolar fine sandy loam, 0 to 5 percent slopes; 20 percent Neso very gravelly fine sandy loam, 0 to 5 percent slopes; and 20 percent Pojo fine sandy loam, 0 to 5 percent slopes. The Kolar soil is in nearly level areas, the Neso soil is on knobs, and the Pojo soil is in concave areas. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Figure 10.—Typical area of Kolar-Neso-Pojo complex, 0 to 5 percent slopes.

Included in this unit are small areas of Berwolf soils in swales, soils that have a loamy sand surface layer and are on the downwind side of eroded areas, and Armesa soils on convex hillslopes. Included areas make up about 10 percent of the total acreage.

The Kolar soil is shallow and well drained. It formed in calcareous alluvium derived from mixed sources. Typically, the surface layer is brown fine sandy loam about 3 inches thick. The subsoil is brown fine sandy loam about 14 inches thick. Indurated caliche is at a depth of 17 inches.

Permeability of the Kolar soil is moderately rapid. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

The Neso soil is very shallow and shallow and is well drained. It formed in hard caliche and loamy material derived from mixed sources. Typically, the surface layer is reddish brown very gravelly fine sandy loam about 4 inches thick. The substratum to a depth of 60 inches or more is light reddish brown extremely cobbly fine sandy loam about 7 inches thick. Indurated caliche is at a depth of 11 inches.

Permeability of the Neso soil is moderately rapid. Available water capacity is very low. Effective rooting depth is 8 to 14 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

The Pojo soil is moderately deep and well drained. It formed in eolian and alluvial material derived from mixed sources. Typically, the surface layer is brown fine sandy loam about 5 inches thick. The subsoil is yellowish red fine sandy loam about 27 inches thick. Indurated caliche is at a depth of 32 inches.

Permeability of the Pojo soil is moderately rapid. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

This unit is used for livestock grazing and wildlife habitat.

The potential natural plant community on the Kolar soil is characterized mainly by hairy grama, black grama, sideoats grama, sand dropseed, and New Mexico feathergrass. Continuous yearlong grazing generally results in a deteriorated plant community, generally of less value for grazing. As the plant community deteriorates, the more desirable forage plants such as black grama, sideoats grama, and New Mexico feathergrass decrease and there is an increase in threeawn, broom snakeweed, yucca, and wolftail, which normally are present only in small amounts in the potential plant community.

The potential natural plant community on the Neso soil is characterized mainly by black grama, hairy grama, New Mexico feathergrass, and bottlebrush squirreltail. As the plant community deteriorates, the more desirable forage plants decrease and there is an increase in wolftail, broom snakeweed, and threeawn, which normally are present only in small amounts in the potential plant community.

The potential natural plant community on the Pojo soil is characterized mainly by black grama, hairy grama, indiangrass, and New Mexico feathergrass. As the plant community deteriorates, the more desirable forage plants such as black grama and indiangrass decrease and there is an increase in blue grama and sand dropseed. Skunkbush sumac commonly is prominent on this soil.

Practices that facilitate rangeland management, such as fencing and constructing pipelines for providing water for livestock, are difficult to apply on the Neso and Kolar soils because of the shallow depth to indurated caliche. These practices are suited to the Pojo soil. Ponds and pit tanks are not suited to this unit because of the very shallow and shallow depth to indurated caliche and the seepage potential. Grazing management that will sustain or increase the vigor, production, and reproduction of the more palatable and productive grasses and shrubs should be implemented. Effective livestock distribution is most commonly accomplished by placing salt for livestock away from water supplies and by fencing. Use of planned grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides a variety of high-quality forage during all seasons of the year. Flexibility in the number of livestock and in the frequency and intensity of grazing is essential to the success of any grazing program. Sufficient residue and litter must be maintained on this unit to reduce soil blowing and damage to young plants.

The average annual production of air-dry vegetation on the Kolar soil ranges from 1,400 pounds per acre in favorable years to 450 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Neso soil ranges from 900 pounds per acre in favorable years to 300 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Pojo soil ranges from 1,500 pounds per acre in favorable years to 500 pounds in unfavorable years.

68—Poquita very fine sandy loam, 0 to 5 percent slopes. This deep, well drained soil is on alluvial flats and toe slopes. It formed in alluvial material derived dominantly from sandstone and shale. Areas are irregular in shape and are 100 to 800 acres in size. The native vegetation is mainly short grasses. Elevation is 4,000 to 4,700 feet. The average annual precipitation is about 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

Typically, the surface layer is brown very fine sandy loam about 8 inches thick. The subsoil is yellowish red and pink loam about 19 inches thick. The substratum to a depth of 60 inches or more is pink loam.

Included in this unit are small areas of a soil that is similar to this Poquita soil and is in similar landscape positions but does not have a well defined layer of lime accumulation. Also included are small areas of San Jon and Reeves soils on the higher convex knobs and ridges. Included areas make up about 20 percent of the total acreage.

Permeability of this soil is moderate. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

This unit is used for livestock grazing and wildlife habitat.

The potential natural plant community on this unit is characterized mainly by blue grama, tobosa, sideoats grama, and vine-mesquite. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the more desirable forage plants such as sideoats grama and vine-mesquite decrease and blue grama forms a dense, low turf that is low in productivity. Species that are present in the plant community in smaller amounts, such as burrograss, ring muhly, threeawn, and broom snakeweed increase, and mesquite invades.

Practices that facilitate rangeland management, such as installing fences, chiseling, pitting, and constructing earthen ponds, pipelines, and troughs for providing water for livestock, are suited to this unit. Rangeland management practices such as proper grazing use, deferred grazing, and planned grazing systems are suited to this unit. Effective livestock distribution is most commonly accomplished by placing salt away from water supplies and by fencing. Grazing management that will sustain or increase the vigor, production, and reproduction of the more palatable and productive grasses and shrubs should be implemented. Use of planned grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides a variety of high-quality forage during all seasons of the year. Flexibility in the number of livestock and in the frequency and intensity of grazing is essential to the success of any grazing program.

The average annual production of air-dry vegetation on this soil ranges from 1,600 pounds per acre in favorable years to 700 pounds in unfavorable years.

69—Deama-Darvey association, 1 to 10 percent slopes. This map unit is on uplands. Areas are irregular in shape and are 100 to 1,000 acres in size. The native vegetation is mainly short grasses. Elevation is 4,700 to 5,000 feet. The average annual precipitation is about 12 to 14 inches, the average annual air temperature is 55 to 57 degrees F, and the average frost-free period is 160 to 180 days.

This unit is 50 percent Deama gravelly loam, 1 to 10 percent slopes, and 35 percent Darvey loam, 1 to 5 percent slopes. The Deama soil is on ridges and upper back slopes, and the Darvey soil is on the lower foot slopes and in sinkholes.

Included in this unit are small areas of Rock outcrop on ridges and hillslopes, soils that have slopes of more than 10 percent, and Pastura soils on some ridges. Included areas make up 15 percent of this unit.

The Deama soil is shallow and well drained. It formed in residuum derived dominantly from limestone. Typically, the surface layer is grayish brown gravelly loam about 7 inches thick. The next layer is light grayish brown extremely gravelly loam about 6 inches thick. Limestone is at a depth of 13 inches.

Permeability of the Deama soil is moderate. Available water capacity is very low. Effective rooting depth is 13 to 16 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Darvey soil is deep and well drained. It formed in calcareous alluvium derived dominantly from limestone. Typically, the surface layer is brown loam about 6 inches thick. The subsoil is light brown loam about 21 inches thick. The substratum to a depth of 60 inches or more is pink loam.

Permeability of the Darvey soil is moderate. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

This unit is used for livestock grazing and wildlife habitat.

The potential natural plant community on the Deama soil is characterized mainly by New Mexico feathergrass, sideoats grama, black grama, and Bigelow sagebrush. Continuous yearlong grazing generally results in a deteriorated plant community, that generally is of less value for grazing. As the plant community deteriorates, the more desirable forage plants decrease and there is an increase in wolftail, blue grama, and broom snakeweed, which normally are present only in small amounts in the potential plant community.

Practices that facilitate rangeland management, such as fencing and constructing pipelines for providing water for livestock, are difficult to apply on the Deama soil because of the shallow depth to limestone.

The potential natural plant community on the Darvey soil is characterized mainly by blue grama, tobosa, and vine-mesquite. As the plant community deteriorates, the more desirable forage plants such as vine-mesquite, sideoats grama, and bottlebrush squirreltail decrease and blue grama forms a dense, low turf that is low in productivity. Species that are present in the plant community in smaller amounts such as burrograss, wolftail, and broom snakeweed increase, and walkingstick cholla invades.

Practices that facilitate rangeland management, such as building fences, chiseling, pitting, and constructing earthen ponds and pipelines and troughs for supplying

water for livestock, are suited to this soil. Areas that are heavily infested with less desirable plants can be improved by chemical or mechanical treatment.

Grazing management that will sustain or increase the vigor, production, and reproduction of the more palatable and productive grasses and shrubs should be implemented. Continuous yearlong grazing results in a deteriorated plant community. This condition usually is accompanied by accelerated soil erosion. Use of planned grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides a variety of high-quality forage during all seasons of the year. Flexibility in the number of livestock and in the frequency and intensity of grazing is essential to the success of any grazing program.

The average annual production of air-dry vegetation on the Deama soil ranges from 1,400 pounds per acre in favorable years to 700 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Darvey soil ranges from 1,500 pounds per acre in favorable years to 400 pounds in unfavorable years.

71—San Jon loam, 0 to 5 percent slopes. This moderately deep, well drained soil is on structural benches. It formed in alluvial and residual sediment derived dominantly from the Seven Rivers Formation. Areas are irregular in shape and are 250 to 2,000 acres in size. The native vegetation is short grasses. Elevation is 3,900 to 4,800 feet. The average annual precipitation is about 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

Typically, the surface layer is light brown loam about 8 inches thick. The subsoil is pink clay loam about 25 inches thick. Below this to a depth of 60 inches or more are weathered sandstone and shale that crush to gray extremely gravelly sandy loam.

Included in this unit are small areas of Reeves soils in concave areas. Included areas make up about 30 percent of the total acreage.

Permeability of this soil is moderately slow. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

This unit is used for livestock grazing and wildlife habitat.

The potential natural plant community on the San Jon soil is characterized mainly by blue grama, tobosa, and sideoats grama. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the more desirable forage plants such as sideoats grama decrease and blue grama forms a dense, low turf that is low in productivity. Species that are present in the plant community in smaller amounts such as ring muhly, sand dropseed, threeawn, and broom snakeweed increase, and mesquite invades.

Practices that facilitate rangeland management, such as building fences and installing pipelines and troughs for supplying water for livestock, are suited to this unit. Construction of earthen ponds is limited because of the moderate depth to rock. Rangeland management practices such as proper grazing use and deferred grazing systems are suited to this unit. Grazing management that will sustain or increase the vigor, production, and reproduction of the more palatable and productive grasses and shrubs should be implemented. Use of planned grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides a variety of high-quality forage during all seasons of the year. Flexibility in the number of livestock and in the frequency and intensity of grazing is essential to the success of any grazing program.

The average annual production of air-dry vegetation ranges from 1,600 pounds per acre in favorable years to 700 pounds in unfavorable years.

72—Lozier-Rock outcrop complex, 1 to 5 percent slopes. This map unit is on upland ridges (fig. 11). It consists of an area that is irregular in shape and is about 6,500 acres in size. The native vegetation is mainly grass. Elevation is 4,000 to 4,500 feet. The average annual precipitation is about 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

This unit is 70 percent Lozier very gravelly loam, 1 to 5 percent slopes, and 20 percent Rock outcrop. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Tucumcari soils in valleys and potholes and areas of soils that have slopes of more than 5 percent. Included areas make up about 10 percent of the total acreage.

The Lozier soil is very shallow and shallow and is well drained. It formed in residuum derived dominantly from limestone. Typically, the surface layer is pale brown very gravelly loam about 3 inches thick. The subsoil is very pale brown extremely cobbly loam about 10 inches thick. Limestone is at a depth of 13 inches.

Permeability of the Lozier soil is moderate. Available water capacity is very low. Effective rooting depth is 7 to 16 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

Rock outcrop consists of limestone. It supports little if any vegetation.

This unit is used for livestock grazing and wildlife habitat.

The potential natural plant community on the Lozier soil is characterized mainly by blue grama, sideoats grama, galleta, and catclaw acacia. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the

Figure 11.—Typical area of Lozier-Rock outcrop complex, 1 to 5 percent slopes.

more desirable forage plants such as sideoats grama decrease and blue grama forms a dense, low turf that is low in productivity. Species that are present in the plant community in smaller amounts such as wolftail, threeawn, burrograss, and broom snakeweed increase, and mesquite invades.

Practices that facilitate rangeland management, such as installing pipelines for providing water for livestock and building fences, are difficult to apply on this soil because of the very shallow and shallow depth to limestone. The soil is not suited to livestock watering ponds and other water impoundments because of the very shallow and shallow depth to limestone. Grazing management practices such as proper grazing use and deferred grazing are suited to this soil. Effective livestock distribution is most commonly accomplished by placing salt away from sources of water. Grazing management that will sustain or increase the vigor, production, and reproduction of the more palatable and productive grasses and shrubs should be implemented. Use of planned grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides a variety of high-quality forage during all seasons of the year. Flexibility in the number of livestock and in the frequency

and intensity of grazing is essential to the success of any grazing program.

The average annual production of air-dry vegetation on the Lozier soil ranges from 1,200 pounds per acre in favorable years to 400 pounds in unfavorable years.

73—Reeves-Holloman association, 0 to 5 percent slopes. This map unit is on uplands. Areas are irregular in shape and are 300 to 2,500 acres in size. The native vegetation is mainly grass. Elevation is 4,000 to 5,000 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

This unit is 50 percent Reeves silt loam, 0 to 5 percent slopes, and 40 percent Holloman loam, 1 to 5 percent slopes. The Reeves soil is in large upland swales, and the Holloman soil is on knobs and ridges.

Included in this unit are small areas of San Jon soils on uplands and Poquita soils in depressional areas. Included areas make up about 10 percent of the total acreage.

The Reeves soil is moderately deep to gypsiferous material and is well drained. It formed in alluvium derived dominantly from gypsum. Typically, the surface layer is brown silt loam about 7 inches thick. The upper part of the subsoil is reddish brown loam about 10 inches thick, and the lower part is reddish brown clay loam about 11 inches thick. The substratum to a depth of 60 inches or more is very pale brown loam and lenses of gypsum.

Permeability of the Reeves soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high. This soil is nonsaline to slightly saline.

The Holloman soil is very shallow and shallow and is well drained. It formed in residuum derived dominantly from gypsiferous material. Typically, the surface layer is pale brown loam about 5 inches thick. The next layer is gypsiferous, very pale brown loam about 14 inches thick. Gypsum is at a depth of 19 inches.

Permeability of the Holloman soil is moderate. Available water capacity is very low. Effective rooting depth is 6 to 19 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high. This soil is slightly saline to moderately saline.

This unit is used for livestock grazing and wildlife habitat.

The potential natural plant community on the Reeves soil is characterized mainly by blue grama, tobosa, sideoats grama, and vine-mesquite. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the more desirable forage plants such as sideoats grama and vine-mesquite decrease and blue grama forms a dense, low turf that is low in productivity. Species that are present in the plant community in smaller amounts such as buffalograss, threeawn, burrograss, and broom snakeweed increase, and walkingstick cholla invades.

Practices that facilitate rangeland management, such as constructing earthen ponds and pipelines and providing troughs for supplying water for livestock, are suited to this soil.

The potential natural plant community on the Holloman soil is characterized mainly by coldenia, black grama, gyp grama, gyp dropseed, and alkali sacaton. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the more desirable forage plants decrease and there is an increase in threeawn, bush muhly, and broom snakeweed, which normally are present only in small amounts in the potential plant community.

Practices that facilitate rangeland management, such as installing pipelines for providing water for livestock, are difficult to apply on this soil because of the very shallow and shallow depth to gypsum. This soil is not suited to practices such as constructing ponds because of the very shallow and shallow depth to gypsum.

Grazing management that will sustain or increase the vigor, production, and reproduction of the more palatable and productive grasses and shrubs on this unit. Use of planned grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides a variety of high-quality forage during all seasons of the year. Flexibility in the number of livestock and in the frequency and intensity of grazing is essential to the success of any grazing program.

The average annual production of air-dry vegetation on the Reeves soil ranges from 1,600 pounds per acre in favorable years to 700 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Holloman soil ranges from 900 pounds per acre in favorable years to 350 pounds in unfavorable years.

102—Redona fine sandy loam, 0 to 2 percent slopes. This deep, well drained soil is in concave areas on uplands. It formed in alluvium derived dominantly from sandstone and shale. Areas are irregular in shape and are 5 to 200 acres in size. The vegetation in areas not cultivated is mainly short grasses. Elevation is 4,000 to 4,500 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

Typically, the surface layer is reddish brown fine sandy loam about 7 inches thick. The subsoil is reddish brown and yellowish red sandy clay loam about 30 inches thick. The substratum to a depth of 60 inches or more is pink sandy clay loam.

Included in this unit are small areas of Chispa and Armesa soils in convex areas. Included areas make up about 15 percent of the total acreage.

Permeability of this Redona soil is moderate. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

This unit is used for irrigated crops, mainly alfalfa, small grain, cotton, and grain sorghum.

The main limitation of this unit for irrigated crops is the hazard of soil blowing. Furrow, border, corrugation, and sprinkler irrigation systems are suited to the unit; however, sprinkler irrigation is best suited. Water should be applied in amounts sufficient to wet the root zone but in amounts small enough to minimize the leaching of plant nutrients. Irrigation water needs to be applied at a rate that insures optimum production without increasing deep percolation, runoff, and erosion. Use of pipe, ditch lining, or drop structures in irrigation ditches facilitates irrigation and reduces ditch erosion.

Soil blowing can be reduced by planting a close growing cover crop. Seeding disturbed areas to native or tame pasture plants also reduces soil blowing. Yields can be maintained or increased by applying fertilizer according to needs as determined by soil tests. Rotation grazing helps to maintain the quality and quantity of forage. Maintaining crop residue on or near the surface reduces runoff, reduces soil blowing, and helps to maintain soil tilth and organic matter content.

This unit is well suited to windbreaks and environmental plantings. Supplemental irrigation may be needed when planting and during dry periods. Among the trees that are suitable for planting are Rocky Mountain juniper, green ash, and Lombardy poplar. Among the shrubs are lilac and fourwing saltbush.

103—Chispa fine sandy loam, 0 to 2 percent slopes. This deep, well drained soil is on uplands. It formed in calcareous alluvium derived dominantly from sandstone and shale. Areas are irregular in shape and are 5 to 200 acres in size. The vegetation in areas not cultivated is mainly short grasses. Elevation is 4,000 to 4,500 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

Typically, the surface layer is brown fine sandy loam about 11 inches thick. The subsoil is reddish brown sandy clay loam about 35 inches thick. The substratum to a depth of 60 inches or more is pink fine sandy loam.

Included in this unit are small areas of soils that have a sandy clay loam surface layer, Redona fine sandy loam in concave areas, Armesa soils on knobs and ridges, and Berwolf soils in the more sandy areas. Included areas make up about 15 percent of the total acreage.

Permeability of this Chispa soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is nonsaline to slightly saline.

This unit is used for irrigated crops, mainly alfalfa, small grain, cotton, and grain sorghum.

The main limitation of this unit for irrigated crops is the hazard of soil blowing. Furrow, border, corrugation, and sprinkler irrigation systems are suited to the unit; however, sprinkler irrigation is best suited. Water should be applied in amounts sufficient to wet the root zone but in amounts small enough to minimize the leaching of plant nutrients. Irrigation water needs to be applied at a rate that insures optimum production without increasing deep percolation, runoff, and erosion. Use of pipe, ditch lining, or drop structures in irrigation ditches facilitates irrigation and reduces ditch erosion.

Soil blowing can be reduced by planting a close growing cover crop. Seeding disturbed areas to native or tame pasture plants also reduces soil blowing. Yields can be maintained or increased by applying fertilizer according to needs as determined by soil tests. Rotation grazing helps to maintain the quality and quantity of forage. Maintaining crop residue on or near the surface reduces runoff, reduces soil blowing, and helps to maintain soil tilth and organic matter content.

This unit is well suited to windbreaks and environmental plantings. Supplemental irrigation may be needed when planting and during dry periods. Among the trees that are suitable for planting are green ash and Lombardy poplar. Among the shrubs are lilac and honeysuckle.

105—Montoya clay loam, 0 to 1 percent slopes. This deep, well drained soil is in old oxbow lakes. It formed in alluvium derived dominantly from red-bed sandstone and shale. Areas are elongated in shape and are 20 to 100 acres in size. The vegetation in areas not cultivated is mainly short grasses. Elevation is 3,900 to 4,100 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

Typically, the surface layer is dark reddish brown clay loam about 6 inches thick. The subsoil is reddish brown clay about 24 inches thick. The substratum to a depth of 60 inches or more is reddish brown clay.

Included in this unit are small areas of Montoya sandy clay loam near the edge of the unit and La Lande soils in the higher lying areas. Included areas make up about 15 percent of the total acreage.

Permeability of this Montoya soil is very slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is nonsaline to slightly saline.

This unit is used for irrigated crops, mainly alfalfa, small grain, and pasture. Some areas are used for urban development.

The main limitations for irrigated crops are a slow water intake rate, very slow permeability, high shrink-swell potential, and salinity in some areas. Border and furrow irrigation systems are suited to this unit. Water needs to be applied at a slow rate over a long period to insure that the root zone is properly wetted. Because of the very slow permeability of the soil, the application of water should be regulated so that water does not stand on the surface and damage the crops. Intensive management is required to reduce the salinity and maintain soil productivity. Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate.

This unit is well suited to hay and pasture. Rotation grazing helps to maintain the quality and quantity of forage. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Leveling helps to insure the uniform application of water. Fertilizer is needed to insure optimum growth of grasses and legumes.

This unit is suited to windbreaks and environmental plantings. The main limitations are the high clay content and salinity in some areas. Among the trees that are best suited to planting are Russian-olive, osageorange, and eastern redcedar. Among the shrubs are American plum and lilac. Supplemental irrigation may be needed when planting and during dry periods.

If this unit is used for urban development, the main limitations are high shrink-swell potential and very slow permeability. Buildings and roads should be designed to offset the effects of shrinking and swelling. If the unit is used for septic tank absorption fields, the limitation of very slow permeability can be overcome by increasing the size of the absorption field.

106—La Lande fine sandy loam, 0 to 1 percent slopes. This deep, well drained soil is on alluvial terraces. It formed in alluvium derived dominantly from sandstone and shale. Areas are irregular in shape and are 5 to 200 acres in size. The vegetation in areas not cultivated is mainly short grasses. Elevation is 3,900 to 4,100 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

Typically, the surface layer is reddish brown fine sandy loam about 10 inches thick. The subsoil is reddish brown sandy clay loam about 22 inches thick. The substratum to a depth of 60 inches or more is reddish brown sandy clay loam. In some areas the surface layer is sandy clay loam.

Included in this unit are small areas of Ima fine sandy loam, soils that have a gravelly or sandy substratum, and Montoya soils adjacent to oxbow lakes. Included areas make up about 15 percent of the total acreage.

Permeability of this La Lande soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

This unit is used for irrigated crops, mainly alfalfa, small grain, and pasture. Some areas are used for urban development.

This unit has few limitations for irrigated crops. Furrow, border, corrugation, and sprinkler irrigation systems are suited to the unit. Water should be applied in amounts sufficient to wet the root zone but in amounts small enough to minimize the leaching of plant nutrients. Yields can be maintained or increased by applying fertilizer according to needs as determined by soil tests. Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures help to maintain fertility and tilth.

This unit is well suited to hay and pasture. Rotation grazing helps to maintain the quality and quantity of forage.

This unit is well suited to windbreaks and environmental plantings. Among the trees that are suitable for planting are green ash, golden willow, and Rocky Mountain juniper. Among the shrubs are honeysuckle and lilac.

This unit is well suited to urban development.

107—Ima fine sandy loam, 0 to 3 percent slopes. This deep, well drained soil is on alluvial terraces. It formed in alluvium derived dominantly from sandstone and shale. Areas are irregular in shape and are 5 to 300 acres in size. The vegetation in areas not cultivated is mainly short grasses. Elevation is 3,900 to 4,100 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

Typically, the surface layer is reddish brown fine sandy loam about 10 inches thick. The subsoil is reddish brown fine sandy loam about 30 inches thick. The substratum to a depth of 60 inches or more is light reddish brown sandy loam.

Included in this unit are small areas of La Lande soils in the lower lying areas. Also included are small areas of Gallen soils that have slopes of more than 3 percent. Included areas make up about 15 percent of the total acreage.

Permeability of this Ima soil is moderately rapid. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

This unit is used for irrigated crops, mainly alfalfa, small grain, and pasture (fig. 12). Some areas are used for urban development.

The main limitations for irrigated crops are moderately rapid water intake rate and moderately rapid permeability. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this unit; however,

Figure 12.—Irrigated alfalfa in an area of Ima fine sandy loam, 0 to 3 percent slopes.

sprinkler irrigation is best suited. To avoid overirrigating and leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs. Use of pipe, ditch lining, or drop structures in irrigation ditches facilitates irrigation and reduces ditch erosion.

Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures help to maintain fertility and tilth. Yields can be maintained or increased by applying fertilizer according to needs as determined by soil tests. Nitrogen fertilizer should be applied in split applications to minimize leaching.

This unit is well suited to hay and pasture. Rotation grazing helps to maintain the quality and quantity of forage.

This unit is well suited to windbreaks and environmental plantings. Among the trees that are suitable for planting are green ash and Rocky Mountain juniper. Among the shrubs are honeysuckle and American plum.

This unit is well suited to urban development.

108—Armesa loamy fine sand, 1 to 3 percent slopes. This deep, well drained soil is on knobs and ridges. It formed in calcareous alluvium derived

dominantly from sandstone and shale. Areas are irregular in shape and are 5 to 300 acres in size. The vegetation in areas not cultivated is mainly short grasses. Elevation is 4,000 to 4,500 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

Typically, the surface layer is brown loamy fine sand about 4 inches thick. The upper 6 inches of the subsoil is brown fine sandy loam, and the lower 9 inches is light brown fine sandy loam. The upper 12 inches of the substratum is pinkish white sandy clay loam, and the lower part to a depth of 60 inches or more is pink gravelly sandy clay loam. In some areas the surface layer is fine sandy loam.

Included in this unit are small areas of Chispa soils on hillslopes, Berwolf soils in depressional areas, and Kolar soils on ridges. Also included are small areas of a soil that is similar to the Armesa soil and overlies old lake deposits that are high in content of sodium. Included areas make up about 25 percent of the total acreage.

Permeability of this Armesa soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is very high.

This unit is used for irrigated crops, mainly small grain, alfalfa, and grain sorghum.

The main limitations of this unit for irrigated crops are the hazard of soil blowing and a zone that is high in content of lime and is at a shallow depth. Sprinkler irrigation is the most suitable method of applying water.

Soil blowing can be reduced by returning crop residue to the soil and practicing minimum tillage. Seeding disturbed areas to native or tame pasture plants also reduces soil blowing. Yields can be maintained or increased by applying fertilizer according to needs as determined by soil tests. Rotation grazing helps to maintain the quality and quantity of forage.

This unit is suited to windbreaks and environmental plantings. The main limitation is a zone that is high in content of lime and is at a shallow depth. Among the trees that are best suited to planting are green ash, Rocky Mountain juniper, and Russian-olive. Among the shrubs are American plum and fourwing saltbush.

109—Armesa loamy fine sand, 3 to 5 percent slopes. This deep, well drained soil is on knobs and ridges. It formed in calcareous alluvium derived dominantly from sandstone and shale. Areas are elongated in shape and are 5 to 100 acres in size. The vegetation in areas not cultivated is mainly short grasses. Elevation is 4,000 to 4,500 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

Typically, the surface layer is brown loamy fine sand about 4 inches thick. The upper 6 inches of the subsoil is brown fine sandy loam, and the lower 7 inches is pinkish gray sandy clay loam. The upper 21 inches of the substratum is pinkish white sandy clay loam, and the lower part to a depth of 60 inches or more is pinkish gray sandy clay loam.

Included in this unit are small areas of Chispa soils on hillslopes, Berwolf soils in depressional areas, and Kolar soils on high ridges. Included areas make up about 25 percent of the total acreage.

Permeability of this Armesa soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is very high.

This unit is used for irrigated crops, mainly small grain, alfalfa, and grain sorghum.

If this unit is used for irrigated crops, it is limited mainly by the hazard of soil blowing and a zone that is high in content of lime and is at a shallow depth. Because of the slope, sprinkler or drip irrigation is most suitable for row crops.

Soil blowing can be reduced by returning crop residue to the soil and practicing minimum tillage. Seeding disturbed areas to native or tame pasture plants also reduces soil blowing. Yields can be maintained or increased by applying fertilizer according to needs as determined by soil tests. Rotation grazing helps to maintain the quality and quantity of forage.

This unit is suited to windbreaks and environmental plantings. The main limitation is a zone that is high in content of lime and is at a shallow depth. Among the trees that are best suited to planting are green ash, golden willow, Rocky Mountain juniper, and Russian-olive. Among the shrubs are American plum and fourwing saltbush.

110—Minneosa fine sandy loam, 0 to 2 percent slopes. This deep, well drained soil is on flood plains and low terraces. It formed in alluvium derived dominantly from sandstone and shale. Areas are irregular in shape and are 5 to 100 acres in size. The vegetation in areas not cultivated is mainly short grasses. Elevation is 3,900 to 4,100 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

Typically, the surface layer is reddish brown fine sandy loam about 8 inches thick. The upper 30 inches of the underlying material is light reddish brown loamy fine sand that has thin strata of fine sandy loam, and the lower part to a depth of 60 inches or more is light reddish brown sand. In some areas the surface layer is loamy fine sand.

Included in this unit are small areas of Ima and La Lande soils on the higher terraces. Included areas make up about 15 percent of the total acreage.

Permeability of this Minneosa soil is moderately rapid. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

Most areas of this unit are used for irrigated crops, mainly alfalfa, small grain, and pasture. A few areas are used as rangeland, and some areas are used for urban development.

The main limitations for irrigated crops are the high hazard of soil blowing, moderately rapid water intake rate, moderately rapid permeability, and low available water capacity. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this unit; however, sprinkler irrigation is best suited. To avoid overirrigating and leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs. Use of pipe, ditch lining, or drop structures in irrigation ditches facilitates irrigation and reduces ditch erosion.

Soil blowing can be reduced by planting a close growing cover crop. Yields can be maintained or increased by applying fertilizer according to needs as determined by soil tests. Nitrogen fertilizer should be applied in split applications to minimize leaching.

This unit is well suited to hay and pasture. Rotation grazing helps to maintain the quality and quantity of forage.

This unit is well suited to windbreaks and environmental plantings. Among the trees that are suitable for planting are Russian-olive, honeylocust, and green ash. Among the shrubs are lilac and honeysuckle.

The potential natural plant community on this unit is mainly blue grama, black grama, sideoats grama, and plains bristlegrass. Continuous yearlong grazing generally results in a deteriorated plant community. As the plant community deteriorates, the desirable forage plants such as black grama, sideoats grama, little bluestem, and plains bristlegrass decrease and blue grama forms a dense, low turf that is low in productivity. Species that are present in the plant community in smaller amounts such as threeawn, sand dropseed, ring muhly, and broom snakeweed increase, and mesquite invades. Areas that are heavily infested with less preferred plants can be improved by chemical or mechanical treatment.

This unit is suited to rangeland management practices such as deferred grazing, livestock water pipelines, and proper range use. Practices that facilitate rangeland management, such as constructing livestock water pipelines, water storage facilities, fences, pit tanks, and ponds, are suited to this unit. Effective distribution of livestock is most frequently accomplished by providing livestock water storage facilities, fencing, and placing salt away from sources of water.

Use of planned grazing systems that vary the seasons of grazing and rest during successive years results in a balanced plant community that provides a variety of high-quality forage during all seasons of the year. Flexibility in the number of livestock and in the frequency and intensity of grazing is essential to the success of any grazing program.

The average annual production of air-dry vegetation ranges from 1,600 pounds per acre in favorable years to 700 pounds in unfavorable years.

This unit is well suited to urban development.

111—La Lande sandy clay loam, gravelly substratum, 0 to 1 percent slopes. This deep, well drained soil is on alluvial terraces. It formed in alluvium derived dominantly from sandstone, shale, and igneous rock. Areas are irregular in shape and are 5 to 50 acres in size. The vegetation in areas not cultivated is mainly short grasses. Elevation is 3,900 to 4,100 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

Typically, the surface layer is dark reddish brown sandy clay loam about 10 inches thick. The subsoil is reddish brown sandy clay loam about 22 inches thick. The substratum is reddish brown sandy clay loam about 8 inches thick over sand and gravel.

Included in this unit are small areas of Gallen soils. Included areas make up about 20 percent of the total acreage.

Permeability of this La Lande soil is moderate to a depth of 40 inches and rapid below this depth. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used for irrigated crops, mainly alfalfa, small grain, and pasture. Some areas are used for urban development.

This unit is limited for irrigated crops by sand and gravel at a depth of 40 inches or more. Furrow, border, corrugation, and sprinkler irrigation systems are suited to the unit. Water should be applied in amounts sufficient to wet the root zone but in amounts small enough to minimize the leaching of plant nutrients. Yields can be maintained or increased by applying fertilizer according to needs as determined by soil tests. Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures help to maintain fertility and tilth.

This unit is well suited to hay and pasture. Rotation grazing helps to maintain the quality and quantity of forage.

This unit is well suited to windbreaks and environmental plantings. Among the trees.that are suitable for planting are Russian-olive, green ash, and Rocky Mountain juniper. Among the shrubs are fourwing saltbush and skunkbush sumac.

This unit is well suited to urban development.

112—La Lande sandy clay loam, 0 to 1 percent slopes. This deep, well drained soil is on alluvial

terraces. It formed in alluvium derived dominantly from sandstone and shale. Areas are irregular in shape and are 5 to 200 acres in size. The vegetation in areas not cultivated is mainly short grasses. Elevation is 3,900 to 4,100 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

Typically, the surface layer is dark reddish brown sandy clay loam about 10 inches thick. The upper 18 inches of the subsoil is reddish brown sandy clay loam, and the lower 12 inches is reddish brown clay loam. The substratum to a depth of 60 inches or more is reddish brown sandy clay loam. In some areas the surface layer is fine sandy loam.

Included in this unit are small areas of Ima soils in the higher lying areas, Montoya soils near old oxbow lakes, and areas of soils that have sand and gravel at a depth of 30 to 40 inches and are near old channels. Included areas make up about 15 percent of the total acreage.

Permeability of this La Lande soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used for irrigated crops, mainly alfalfa, small grain, and pasture. Some areas are used for urban development.

This unit has few limitations for irrigated crops. Furrow, border, corrugation, and sprinkler irrigation systems are suited to the unit. Water should be applied in amounts sufficient to wet the root zone but in amounts small enough to minimize the leaching of plant nutrients. Yields can be maintained or increased by applying fertilizer according to needs as determined by soil tests. Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures help to maintain fertility and tilth.

This unit is well suited to hay and pasture. Rotation grazing helps to maintain the quality and quantity of forage.

This unit is well suited to windbreaks and environmental plantings. Among the trees that are suitable for planting are Russian-olive, green ash, and Rocky Mountain juniper. Among the shrubs are lilac and honeysuckle.

This unit is well suited to urban development.

113—Montoya Variant sandy clay loam, 0 to 1 percent slopes. This deep, well drained soil is on alluvial terraces adjacent to old oxbow lakes. It formed in alluvium derived dominantly from sandstone and shale. Areas are irregular in shape and are 5 to 200 acres in size. The vegetation in areas not cultivated is mainly short grasses. Elevation is 3,900 to 4,100 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

Typically, the surface layer is dark reddish brown sandy clay loam about 10 inches thick. The next layer is reddish brown fine sandy loam about 8 inches thick. The subsoil to a depth of 60 inches or more is reddish brown clay. In some areas the surface layer is clay loam.

Included in this unit are small areas of Ima and La Lande soils in the higher lying areas. Included areas make up about 15 percent of the total acreage.

Permeability of this Montoya Variant soil is moderate to a depth of 18 inches and very slow below this depth. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used for irrigated crops, mainly alfalfa, small grain, and pasture. Some areas are used for urban development.

This unit is limited for irrigated crops mainly by the very slow permeability. Furrow, border, corrugation, and sprinkler irrigation systems are suited to the unit. Water needs to be applied at a slow rate over a long period to insure that the root zone is properly wetted. Because of the very slow permeability of the soil, the application of water should be regulated so that water does not stand on the surface and damage the crops. Subsoiling improves water infiltration and allows salts to be leached downward.

This unit is well suited to hay and pasture. Rotation grazing helps to maintain the quality and quantity of forage. Yields can be maintained or increased by applying fertilizer according to needs as determined by soil tests.

This unit is suited to windbreaks and environmental plantings. The main limitation is the high content of clay. Among the trees that are suitable for planting are Rocky Mountain juniper and eastern redcedar. Among the shrubs are lilac and honeysuckle.

If this unit is used for urban development, the main limitations are high shrink-swell potential, low soil strength, and very slow permeability. Buildings and roads should be designed to offset the effects of shrinking and swelling and the low soil strength. If this unit is used for septic tank absorption fields, the limitation of very slow permeability can be overcome by increasing the size of the absorption field.

114—Montoya Variant fine sandy loam, 0 to 1 percent slopes. This deep, well drained soil is on alluvial terraces adjacent to old oxbow lakes. It formed in alluvium derived dominantly from sandstone and shale. Areas are irregular in shape and are 5 to 100 acres in size. The vegetation in areas not cultivated is mainly short grasses. Elevation is 3,900 to 4,100 feet. The average annual precipitation is 13 to 15 inches, the

average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

Typically, the surface layer is reddish brown fine sandy loam about 10 inches thick. The next layer is reddish brown fine sandy loam about 8 inches thick. The subsoil to a depth of 60 inches or more is reddish brown silty clay loam and clay. In some areas the surface layer is sandy clay loam.

Included in this unit are small areas of Ima and La Lande soils in the higher lying areas. Included areas make up about 15 percent of the total acreage.

Permeability of this Montoya soil is moderately rapid to a depth of 18 inches and very slow below this depth. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

This unit is used for irrigated crops, mainly alfalfa, small grain, and pasture. Some areas are used for urban development.

This main limitation of this unit for irrigated crops is the very slow permeability. Furrow, border, corrugation, and sprinkler irrigation systems are suited to the unit. Irrigation water needs to be applied at a rate that insures optimum production without increasing runoff and erosion. Because of the very slow permeability of the soil, the application of water should be regulated so that water does not stand on the surface and damage the crops. Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures help to maintain fertility and tilth.

This unit is well suited to hay and pasture. Rotation grazing helps to maintain the quality and quantity of forage. Yields can be maintained or increased by applying fertilizer according to needs as determined by soil tests.

This unit is well suited to windbreaks and environmental plantings. Among the trees that are suitable for planting are eastern redcedar, green ash, and Russian-olive. Among the shrubs are honeysuckle and lilac.

If this unit is used for urban development, the main limitations are high shrink-swell potential, low soil strength, and very slow permeability. Buildings and roads should be designed to offset the effects of shrinking and swelling and low soil strength. If the unit is used for septic tank absorption fields, the limitation of very slow permeability can be overcome by increasing the size of the absorption field.

115—Minneosa sandy clay loam, 0 to 1 percent slopes. This deep, well drained soil is on alluvial terraces. It formed in alluvium derived dominantly from sandstone and shale. Areas are irregular in shape and are 5 to 100 acres in size. The vegetation in areas not cultivated is mainly short grasses. Elevation is 3,900 to 4,100 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

Typically, the surface layer is reddish brown sandy clay loam about 14 inches thick. The underlying material to a depth of 35 inches is stratified lenses of reddish brown fine sandy loam and loamy fine sand. River sand extends to a depth of 60 inches or more.

Included in this unit are small areas of Ima fine sandy loam in the higher lying areas and La Lande soils in the lower lying areas. Included areas make up about 25 percent of the total acreage.

Permeability of this Minneosa soil is moderate to a depth of 14 inches and moderately rapid below this depth. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used for irrigated crops, mainly alfalfa, small grain, and pasture. Some areas are used for urban development.

This unit is limited for irrigated crops mainly by the moderately rapid permeability. Furrow, border, corrugation, and sprinkler irrigation systems are suited to the unit. To avoid overirrigating and leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs. Use of pipe, ditch lining, or drop structures in irrigation ditches facilitates irrigation and reduces ditch erosion.

Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures help to maintain fertility and tilth. Yields can be maintained or increased by applying fertilizer according to needs as determined by soil tests. Nitrogen fertilizer should be applied in split applications to minimize leaching.

This unit is well suited to hay and pasture. Rotation grazing helps to maintain the quality and quantity of forage.

This unit is well suited to windbreaks and environmental plantings. Among the trees that are suitable for planting are Russian-olive, honeylocust, and eastern redcedar. Among the shrubs are lilac and honeysuckle.

This unit is well suited to urban development.

116—Chispa sandy clay loam, 0 to 2 percent slopes. This deep, well drained soil is on uplands. It formed in calcareous alluvium derived dominantly from sandstone and shale. Areas are irregular in shape and are 5 to 30 acres in size. The vegetation in areas not cultivated is mainly short grasses. Elevation is 4,000 to 4,500 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

Typically, the surface layer is reddish brown sandy clay loam about 12 inches thick. The subsoil is reddish brown sandy clay loam about 18 inches thick. The upper 14 inches of the substratum is reddish yellow sandy clay loam, and the lower part to a depth of 60 inches or more is light reddish brown fine sandy loam. In some areas the surface layer is fine sandy loam.

Included in this unit are small areas of Armesa soils on ridges, a soil that is similar to this Chispa soil but has more clay and is in depressional areas, and Redona soils in concave areas. Included areas make up about 20 percent of the total acreage.

Permeability of this Chispa soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is nonsaline to slightly saline.

This unit is used for irrigated crops, mainly small grain, alfalfa, and grain sorghum.

The main limitation of this unit for irrigated crops is the moderate water intake rate. Furrow, border, corrugation, and sprinkler irrigation systems are suited to the unit. Water needs to be applied at a slow rate over a long period to ensure that the root zone is properly wetted. Use of pipe, ditch lining, or drop structures in irrigation ditches facilitates irrigation and reduces ditch erosion. Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate.

Yields can be maintained or increased by applying fertilizer according to needs as determined by soil tests. Rotation grazing helps to maintain the quality and quantity of forage.

This unit is well suited to windbreaks and environmental plantings. Supplemental irrigation may be needed when planting and during dry periods. Among the trees that are suitable for planting are Russian-olive, green ash, and Rocky Mountain juniper. Among the shrubs are lilac and honeysuckle.

117—Berwolf loamy fine sand, 1 to 3 percent slopes. This deep, well drained soil is on uplands. It formed in eolian and alluvial deposits derived dominantly from sandstone and shale. Areas are irregular in shape and are 5 to 300 acres in size. The vegetation in areas not cultivated is mainly short grasses. Elevation is 4,000 to 4,500 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

Typically, the surface layer is light brown loamy fine sand about 12 inches thick. The subsoil is yellowish red fine sandy loam about 28 inches thick. The substratum to a depth of 60 inches or more is reddish brown fine sandy loam.

Included in this unit are small areas of Armesa and Chispa soils on convex hillslopes, Redona soils in depressional areas, and Roswell soils in areas of dunes. Included areas make up about 20 percent of the total acreage.

Permeability of this Berwolf soil is moderately rapid. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is very high.

This unit is used for irrigated crops, mainly small grain, alfalfa, and grain sorghum.

The main limitations of this unit for irrigated crops are the hazard of soil blowing and moderately rapid permeability. Furrow, border, corrugation, and sprinkler irrigation systems are suited to the unit; however, sprinkler irrigation is best suited. To avoid overirrigating and leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs. Use of pipe, ditch lining, or drop structures in irrigation ditches facilitates irrigation and reduces ditch erosion.

Soil blowing can be reduced by returning crop residue to the soil, practicing minimum tillage, and planting a close growing crop. Yields can be maintained or increased by applying fertilizer according to needs as determined by soil tests. Rotation grazing helps to maintain the quality and quantity of forage.

This unit is well suited to windbreaks and environmental plantings. Supplemental irrigation may be needed when planting and during dry periods. Among the trees that are suitable for planting are Rocky Mountain juniper, green ash, and honeylocust. Among the shrubs are American plum, lilac, and fourwing saltbush.

118—Berwolf fine sandy loam, 0 to 3 percent slopes. This deep, well drained soil is on uplands. It formed in eolian and alluvial deposits derived dominantly from sandstone and shale. Areas are irregular in shape and are 5 to 200 acres in size. The vegetation in areas not cultivated is mainly short grasses. Elevation is 4,000 to 4,500 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 58 to 60 degrees F, and the average frost-free period is 180 to 200 days.

Typically, the surface layer is reddish brown fine sandy loam about 7 inches thick. The subsoil is yellowish red fine sandy loam about 33 inches thick. The substratum to a depth of 60 inches or more is reddish yellow and pink fine sandy loam. In some areas the surface layer is loamy fine sand.

Included in this unit are small areas of Redona and Chispa soils on side slopes, Roswell soils in dune areas, and Minneosa soils in areas where river strata are near the surface. Included areas make up about 20 percent of the total acreage.

Permeability of this Berwolf soil is moderately rapid. Available water capacity is high. Effective rooting depth

is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

This unit is used for irrigated crops, mainly small grain, alfalfa, and grain sorghum. It is limited mainly by the hazard of soil blowing and moderately rapid permeability. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this unit; however, sprinkler irrigation is best suited. To avoid overirrigating and leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs. Use of pipe, ditch lining, or drop structures in irrigation ditches facilitates irrigation and reduces ditch erosion.

Soil blowing can be reduced by returning crop residue to the soil and practicing minimum tillage. Yields can be maintained or increased by applying fertilizer according to needs as determined by soil tests.

Soil blowing can also be reduced by planting a close growing cover crop. Rotation grazing helps to maintain the quality and quantity of forage.

This unit is well suited to windbreaks and environmental plantings. Supplemental irrigation may be needed when planting and during dry periods. Among the trees that are suitable for planting are green ash, Rocky Mountain juniper, and honeylocust. Among the shrubs are American plum, fourwing saltbush, and lilac.

Prime Farmland

Prime farmland, as defined by the United States Department of Agriculture, is the land that is best suited for producing food, feed, forage, fiber, and oilseed crops. It must either be used for producing food or fiber or be available for these uses. It has the soil quality, length of growing season, and moisture supply needed to economically produce a sustained high yield of crops when it is managed properly. Prime farmland produces the highest yields with minimal energy and economic resources, and farming it results in the least disturbance of the environment.

Prime farmland commonly has an adequate and dependable supply of moisture from precipitation or irrigation. It also has a favorable temperature and length of growing season, an acceptable salt and sodium content, and an acceptable level of acidity or alkalinity. It has few, if any, rock fragments and is permeable to water and air. Prime farmland is not excessively eroded or saturated with water for long periods and is not flooded frequently during the growing season. Soils that are limited by a hazard of flooding may qualify for prime farmland if this limitation can be overcome. Onsite investigation is needed to determine the extent of the limitation.

In this survey area, an adequate and dependable supply of suitable quality irrigation water is necessary to meet the requirements for prime farmland. About 14,000 acres, or about 0.9 percent, of the survey area is irrigated. Not all of the irrigated areas, however, are prime farmland. Irrigated areas are south and east of Fort Sumner and in scattered areas north and west of Fort Sumner. The major crops grown are alfalfa hay and small grain.

The following map units meet the soil requirements for prime farmland when irrigated.

105 Montoya clay loam, 0 to 1 percent slopes
106 La Lande fine sandy loam, 0 to 1 percent slopes
107 Ima fine sandy loam, 0 to 3 percent slopes
111 La Lande sandy clay loam, gravelly substratum, 0 to 1 percent slopes
112 La Lande sandy clay loam, 0 to 1 percent slopes
113 Montoya Variant sandy clay loam, 0 to 1 percent slopes
114 Montoya Variant fine sandy loam, 0 to 1 percent slopes
115 Minneosa sandy clay loam, 0 to 1 percent slopes

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

By Wesley A. Robbins, conservation agronomist, Soil Conservation Service.

General management needed for crops and for hay and pasture is suggested in this section. The system of land capability classification used by the Soil Conservation Service is explained, and the estimated yields of the main crops and hay and pasture plants commonly grown are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

Irrigated Cropland

About 14,000 acres of irrigated cropland and irrigated pastureland are in this survey area. The areas of irrigated land are along the Pecos River and on the gently sloping to nearly level uplands near Fort Sumner.

Water for most of the irrigated cropland is delivered by canal from diversions of the Pecos River to Fort Sumner Irrigation District. Irrigation water is adequate for good crop yields during most years. Water for the upland areas is from wells.

The main crops are alfalfa for hay, improved grasses for pasture, grain sorghum, corn, and small grain for pasture and hay. Other crops include vegetables, orchard crops, and cotton. There is good potential for increased production of high-value crops such as vegetables.

The major objectives in cropland management are achieving proper irrigation water management, maintaining soil tilth and fertility, and controlling soil blowing. Irrigation water management consists of determining and controlling the proper rate, amount, and timing of irrigation water applications in a planned and efficient manner. To achieve proper irrigation water management, it is desirable to have a well designed conservation irrigation system based on the characteristics of the soil and the crops to be grown. Timely applications of the proper amount of irrigation water without overirrigating is essential to obtain high yields and to conserve water. Where needed, conservation practices such as installing irrigation pipelines, land leveling, or installing ditch lining should be used in some areas to conserve water, improve efficiency, minimize erosion, and increase productivity.

Several management practices designed to maintain soil tilth and fertility and to control soil and water erosion are applicable to all of the irrigated soil in the survey area. These include use of conservation cropping systems, crop residue management, cover and green manure crops, and proper fertilization according to the needs of the crop and the desired level of production.

Nonirrigated Cropland

About 600 acres of nonirrigated cropland is in the northeastern part of the survey area. It is in the Southern High Plains Major Land Resource Area. Nonirrigated farming is limited by the low and uncertain precipitation and a hazard of soil blowing.

Conservation measures such as terracing, maintaining grass barriers, contour tillage, and stubble mulching are commonly used. Summer fallow, with weeds controlled by herbicides or tillage, is a common practice that allows moisture to be stored in the soil until the next crop is planted.

Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 3. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 3 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows (*8*), in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The capability classification of the soils suited to crops and pasture is given in table 3.

Rangeland

By Kenneth W. Williams, range conservationist, Soil Conservation Service.

Rangeland is land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. In areas that have similar climate and topography, the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on knowledge about the relationship among the soils, vegetation, and water.

The relationship between mapped soils and vegetation was studied during this survey. It is expressed in the section "Detailed Soil Map Units" in terms of the potential natural plant community for the major soils. In the following paragraphs, the potential natural plant community is defined as well as some of the other terms used in the map unit descriptions.

A potential natural plant community is an association of plants that are best adapted to a unique combination of environmental factors. Even on the same soil, these plants vary naturally in their proportions or production from place to place or from year to year. The dominant plant or plants are used to characterize the plant community because of their relative stability where abnormal disturbance or physical site deterioration has not occurred. The grasses, forbs, and shrubs that characterize the potential natural plant community on each major soil are listed by common name in the map units.

Once the plant community has been characterized for each soil, similar plant communities are grouped into range sites. A range site is a distinctive kind of rangeland that produces a characteristic natural plant community that differs from other natural plant communities in kind, amount, or proportion of range plants. Soil properties that have the greatest influence on the productivity of range plants are those that affect the availability of moisture and plant nutrients. Other soil properties, such as soil reaction, salt content, and the presence or absence of a high water table during any period of the year, are also important factors in differentiating range sites. Range site descriptions can be used to identify the proportions of the total annual production of each plant. Information on the range sites in this survey area is available in the local office of the Soil Conservation Service.

The average annual production is also discussed in the detailed map unit descriptions. This is the amount of air-dry vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. The total production that can be used for forage depends upon the kind of grazing animals, the season of use, and other uses that might be made of the resource in addition to grazing. The average annual production includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable and unfavorable years. In a favorable year, the amount and distribution of precipitation received during times of favorable soil and air temperatures make growing conditions substantially better than average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Rangeland management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range condition. Range condition is determined by comparing the present plant community with the potential natural plant community in a particular range site. The more closely the existing community resembles the potential community, the better the range condition. Range condition is, in this respect, an ecological rating only. It is not in itself a direct "value" rating for any specific use.

The objective in rangeland management may be to manage grazing so that the plants growing on a site are about the same in kind and amount as those in the potential natural plant community for that site. Such management generally results in the optimum production of forage, conservation of water, and control of erosion. In some situations, however, a range condition somewhat below potential will promote adequate conservation of soil and water while at the same time producing benefits that contribute to the objective of the landowner or landuser.

About 95 percent of the survey area is rangeland that produces grasses, shrubs, and forbs suitable for grazing or browsing by livestock. The livestock produced on the rangeland is one of the sources of agricultural income in the survey area.

The rangeland in the survey area is suitable for grazing during any season of the year. In winter, however, most ranchers supplement the native forage with high quality hay or protein concentrate. Yearlong cow and calf operations are the dominant ranch enterprise, but both cattle and sheep are grazed in the western part of the survey area. The size of the ranches ranges from a few hundred acres to as much as 60,000 acres.

The information in this section and in the detailed map unit descriptions can be used in planning a range management program that can result in increased forage production and adequate protection of the soils.

Windbreaks and Environmental Plantings

By Bob Bruce, forester, Soil Conservation Service.

Early during the settlement of De Baca County, some farmstead windbreaks were planted. Most of the plantings were made in the valley around Fort Sumner. The main species were mulberry, honeylocust, Siberian elm, and cottonwood. The windbreaks are used mainly for erosion control, livestock protection, enhancement of wildlife habitat and recreation areas, esthetic purposes, watershed protection, and protection of gardens, homes, and crops.

Windbreaks are needed around many farmsteads, in cultivated areas where the hazard of soil blowing is severe, and for protection of livestock in feedlots and on pasture and range.

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, hold snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure survival of plant, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 4 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils soils when irrigated. The estimates in table 4 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a nursery.

Recreation

The soils of the survey area are rated in table 5 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 5, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 5 can be supplemented by other information in this survey, for example, interpretations for dwellings without basements and for local roads and streets in table 7 and interpretations for septic tank absorption fields in table 8.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm

when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

By Edwin A. Swenson, biologist, Soil Conservation Service.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 6, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, lovegrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and grama.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are yucca, mesquite, oak, skunkbush, and fourwing saltbush.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, saltgrass, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, and seeded pastures. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include quail, pheasant, meadowlark, field sparrow, cottontail, and striped skunk.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, and muskrat.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland include antelope, mule deer, scaled quail, black-tailed jackrabbit, meadowlark, and horned lark.

Engineering

By Walter E. Gassman, area engineer, Soil Conservation Service.

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building Site Development, Sanitary Facilities, Construction Materials, and Water Management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps and soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 7 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of

gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 8 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 8 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 8 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage because of rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 8 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a

high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to wind erosion.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 9 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 9, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a *probable* source has a layer of clean sand or gravel or a layer of sand or gravel that is as much as 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an *improbable* source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and

cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 10 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features listed in tables are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 11 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture (*7*). These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the system adopted by the American Association of State Highway and Transportation Officials (*1*) and the Unified soil classification system (*2*).

The Unified system (*5*) classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points)

across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 12 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of the soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, very fine sand,

sand, and organic matter (up to 4 percent) and on soil structure and permeability. The estimates are modified by the presence of rock fragments. Values of K range from 0.02 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the amount of stable aggregates 0.84 millimeters in size. These are represented idealistically by USDA textural classes. Soils containing rock fragments can occur in any group.

1. Sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.
2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.
3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.
5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.
6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.
7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.
8. Stony or gravelly soils and other soils not subject to wind erosion.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 12, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 13 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 13 gives the frequency of flooding. It is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs, on the average, no more than once in 2 years; and *frequent* that it occurs, on the average, more than once in 2 years.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Cemented pans are cemented or indurated subsurface layers within a depth of 5 feet. Such pans cause difficulty in excavation. Pans are classified as thin or thick. A *thin* pan is less than 3 inches thick if continuously indurated or less than 18 inches thick if discontinuous or fractured. Excavations can be made by trenching machines, backhoes, or small rippers. A *thick* pan is more than 3 inches thick if continuously indurated or more than 18 inches thick if discontinuous or fractured. Such a pan is so thick or massive that blasting or special equipment is needed in excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*9*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 14 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Aridisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Argid (*Arg*, meaning an increase in clay, plus *id*, from Aridisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplargids (*Hapl*, meaning minimal horizonation, plus *argid*, the suborder of the Aridisols that have an increase in clay).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Ustollic* identifies the subgroup that has more organic matter than typical. An example is Ustollic Haplargids.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, thermic Ustollic Haplargids.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Taxonomic Units and Their Morphology

In this section, each taxonomic unit recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each unit. A pedon, a small three-dimensional area of soil, that is typical or representative of the Taxonomic unit in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual* (*7*). Many of the technical terms used in the descriptions are defined in *Soil Taxonomy* (*9*). Unless otherwise stated, colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the taxonomic unit.

The map units of each taxonomic unit are described in the section "Detailed Soil Map Units."

Armesa Series

The soils in the Armesa series are classified as fine-loamy, carbonatic, thermic Ustollic Calciorthids. These deep, well drained soils formed in calcareous alluvium derived mainly from sandstone and shale. They are on uplands. Slope is 0 to 10 percent. Elevation is 3,800 to 5,000 feet. The average annual precipitation is 13 to 15 inches. The average annual air temperature is 58 to 60 degrees F, and the frost-free period is 180 to 200 days.

Typical pedon of an Armesa fine sandy loam in an area of Berwolf-Chispa-Armesa association, 0 to 5

percent slopes; about 8 miles south of Fort Sumner; 2,000 feet south and 2,200 feet east of the northwest corner of sec. 25, T. 1 N., R. 26 E.

A—0 to 4 inches; brown (7.5YR 5/4) fine sandy loam, dark brown (7.5YR 4/4) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many fine and very fine roots; violently effervescent; disseminated calcium carbonate; moderately alkaline; clear smooth boundary.

Bw—4 to 15 inches; brown (7.5YR 5/4) fine sandy loam, dark brown (7.5YR 4/4) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; many fine and very fine roots; violently effervescent; disseminated calcium carbonate; moderately alkaline; abrupt wavy boundary.

Bk1—15 to 24 inches; light reddish brown (5YR 6/4) sandy clay loam, reddish brown (5YR 5/4) moist; moderate medium subangular structure; slightly hard, friable, slightly sticky and nonplastic; few fine roots; violently effervescent; many medium soft masses and nodules of calcium carbonate; moderately alkaline; gradual wavy boundary.

Bk2—24 to 37 inches; light reddish brown (5YR 6/4) sandy clay loam, reddish brown (5YR 5/4) moist; moderate fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; violently effervescent; common small soft masses of calcium carbonate; moderately alkaline; gradual wavy boundary.

Bk3—37 to 60 inches; pink (5YR 7/4) sandy clay loam, light reddish brown (5YR 6/4) moist; massive; hard, friable, slightly sticky and slightly plastic; violently effervescent; common large soft masses of calcium carbonate; moderately alkaline.

Depth to the upper boundary of the calcic horizon is 7 to 19 inches. Calcium carbonate equivalent ranges from 45 to 65 percent in the control section. Coarse fragment content generally ranges from 0 to 10 percent, but it is as much as 35 percent in the Bk horizon in some pedons.

The A horizon has hue of 5YR, 7.5YR, or 10YR, value of 5 or 6 when dry and 3 to 5 when moist, and chroma of 3 or 4. Texture is sandy clay loam, loamy fine sand, or fine sandy loam. Some pedons are leached in this horizon.

The Bw horizon has hue of 5YR, 7.5YR, or 10YR, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 2 to 4. Texture is fine sandy loam or sandy clay loam.

The Bk horizon has hue of 5YR or 7.5YR, value of 6 to 8 when dry and 5 to 7 when moist, and chroma of 2 to 8. Texture is sandy clay loam, gravelly sandy clay loam, or fine sandy loam.

Berwolf Series

The soils in the Berwolf series are classified as coarse-loamy, mixed, thermic Ustollic Haplargids. These deep, well drained soils formed in eolian and alluvial material derived mainly from sandstone and shale. They are on uplands and in valleys. Slope is 0 to 5 percent. Elevation is 3,700 to 5,000 feet. The average annual precipitation is 13 to 16 inches. The average annual air temperature is 58 to 60 degrees F, and the frost-free period is 180 to 200 days.

Typical pedon of a Berwolf fine sandy loam in an area of Berwolf-Sharvana association, 0 to 3 percent slopes; about 10 miles north and 2 miles west of Taiban; 1,500 feet north and 2,500 feet west of the southwest corner of sec. 19, T. 4 N., R. 28 E.

A—0 to 11 inches; brown (7.5YR 4/4) fine sandy loam, dark brown (7.5YR 3/4) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many fine and very fine roots; mildly alkaline; clear smooth boundary.

Bt1—11 to 20 inches; reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and nonplastic; common fine and very fine roots and few medium roots; common thin clay films on faces of peds and in pores; moderately alkaline; clear wavy boundary.

Bt2—20 to 34 inches; yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and nonplastic; few fine and very fine roots; many thin clay films on faces of peds and in pores; slightly effervescent; disseminated calcium carbonate; moderately alkaline; clear wavy boundary.

Bk1—34 to 45 inches; reddish yellow (5YR 6/6) fine sandy loam, yellowish red (5YR 5/6) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few fine and very fine roots; violently effervescent; common fine soft masses and few medium nodules of calcium carbonate; moderately alkaline; abrupt wavy boundary.

Bk2—45 to 60 inches; pink (5YR 8/3) fine sandy loam, reddish yellow (5YR 7/6) moist; massive; very hard, friable, slightly sticky and nonplastic; violently effervescent; many large soft masses and nodules of calcium carbonate; moderately alkaline.

Depth to the calcic horizon ranges from 30 to 60 inches.

The A horizon has hue of 5YR or 7.5YR, value of 4 to 6 when dry and 3 or 4 when moist, and chroma of 2 to 6. It is loamy fine sand or fine sandy loam.

The Bt horizon has hue of 2.5YR to 7.5YR, value of 4 to 6 when dry and 3 to 5 when moist, and chroma of 3 to 6. It is fine sandy loam or sandy loam.

The Bk horizon has hue of 2.5YR to 7.5YR, value of 5 to 8 when dry and 4 to 7 when moist, and chroma of 2 to 8. It is fine sandy loam, loamy fine sand, or sandy loam.

Cardenas Series

The soils in the Cardenas series are classified as loamy, mixed, mesic, shallow Ustollic Paleorthids. These shallow, well drained soils formed in alluvium derived from mixed sources. They are on hills and ridges. Slope is 1 to 15 percent. Elevation is 5,000 to 5,400 feet. The average annual precipitation is 12 to 14 inches. The average annual air temperature is 55 to 57 degrees F, and the frost-free period is 160 to 180 days.

Typical pedon of Cardenas loamy fine sand, 1 to 15 percent slopes; about 10 miles north and 3 miles east of Ramon; 1,500 feet east and 1,500 feet north of the southwest corner of sec. 28, T. 2 N., R. 20 E.

A—0 to 3 inches; light brown (7.5YR 6/4) loamy fine sand, brown (7.5YR 5/4) moist; weak medium platy structure; loose, very friable, nonsticky and nonplastic; many fine and very fine roots; mildly alkaline; clear smooth boundary.

Bw—3 to 9 inches; light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; many fine and very fine roots; violently effervescent; disseminated calcium carbonate; moderately alkaline; clear wavy boundary.

Bk—9 to 14 inches; brown (7.5YR 5/4) fine sandy loam, dark brown (7.5YR 4/4) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; many fine and very fine roots; violently effervescent; disseminated calcium carbonate; moderately alkaline; abrupt wavy boundary.

Bkm—14 inches; indurated caliche.

The profile has hue of 7.5YR or 10YR, value of 3 to 6 when dry and 3 to 5 when moist, and chroma of 2 to 4. Depth to indurated caliche ranges from 10 to 20 inches.

Chispa Series

The soils in the Chispa series are classified as fine-loamy, mixed, thermic Ustollic Calciorthids. These deep, well drained soils formed in calcareous alluvium derived mainly from sandstone and shale. They are on uplands. Slope is 0 to 5 percent. Elevation is 3,800 to 5,200 feet. The average annual precipitation is 13 to 15 inches. The average annual air temperature is 58 to 60 degrees F, and the frost-free period is 180 to 200 days.

Typical pedon of a Chispa fine sandy loam in an area of Berwolf-Chispa-Armesa association, 0 to 5 percent slopes; about 6 miles south of Fort Sumner; 20 feet north and 2,500 feet west of the southwest corner of sec. 20, T. 2 N., R. 26 E.

A—0 to 10 inches; brown (7.5YR 4/4) fine sandy loam, dark brown (7.5YR 3/4) moist; moderate fine granular structure; slightly hard, very friable, nonsticky and nonplastic; many fine and very fine roots; violently effervescent; disseminated calcium carbonate; moderately alkaline; clear smooth boundary.

Bk1—10 to 31 inches; brown (7.5YR 5/4) sandy clay loam, strong brown (7.5YR 4/6) moist; weak medium subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; violently effervescent; many medium soft masses and nodules of calcium carbonate; moderately alkaline; clear wavy boundary.

Bk2—31 to 42 inches; light brown (7.5YR 6/4) sandy clay loam, strong brown (7.5YR 4/6) moist; moderate medium subangular blocky structure; very hard, friable, sticky and plastic; few fine and very fine roots; violently effervescent; many large soft masses and common medium nodules of calcium carbonate; moderately alkaline; clear wavy boundary.

Bk3—42 to 60 inches; light reddish brown (5YR 6/4) sandy clay loam, reddish brown (5YR 4/4) moist; massive; very hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; violently effervescent; few large soft masses and nodules of calcium carbonate; moderately alkaline.

The profile commonly is calcareous throughout. Some pedons are leached in the upper 3 to 4 inches. The calcic horizon is 15 to 40 percent calcium carbonate equivalent.

The A horizon has hue of 5YR, 7.5YR, or 10YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 2 to 4. Texture is fine sandy loam, loam, or sandy clay loam.

The Bk1 and Bk2 horizons have hue of 2.5YR, 5YR, or 7.5YR, value of 4 to 7 when dry and 3 to 6 when moist, and chroma of 4 to 6. Texture is sandy clay loam or clay loam that is 18 to 35 percent clay. Calcium carbonate ranges from disseminated throughout to many soft masses and nodules.

The Bk3 horizon has hue of 2.5YR, 5YR, or 7.5YR, value of 6 to 8 when dry and 4 to 7 when moist, and chroma of 4 or 6. Texture is sandy loam, sandy clay loam, or loam.

Clovis Series

The soils in the Clovis series are classified as fine-loamy, mixed, mesic Ustollic Haplargids. These deep, well drained soils formed in loamy material derived from mixed sources. The soils are in broad valleys. Slope is 0 to 3 percent. Elevation is 4,800 to 5,400 feet. The average annual precipitation is 12 to 14 inches. The average annual air temperature is 55 to 57 degrees F, and the frost-free period is 160 to 180 days.

Typical pedon of a Clovis loam in an area of Clovis-Pastura association, 0 to 5 percent slopes; about 3 miles northeast of Ramon; 2,000 feet east and 1,000 feet south of the northwest corner of sec. 31, T. 1 N., R. 20 E.

A—0 to 3 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; moderate thin platy structure; soft, very friable, slightly sticky and slightly plastic; many fine and very fine roots; mildly alkaline; clear smooth boundary.

Bt—3 to 24 inches; brown (7.5YR 5/4) clay loam, brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; very hard, friable, sticky and plastic; common fine and very fine roots; thin continuous clay films on faces of peds; mildly alkaline; clear wavy boundary.

Btk—24 to 29 inches; reddish brown (5YR 5/4) heavy loam, reddish brown (5YR 4/4) moist; moderate medium subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; few thin continuous clay films on faces of peds; violently effervescent; common medium soft masses of calcium carbonate; moderately alkaline; clear wavy boundary.

Bk—29 to 60 inches; pink (5YR 8/4) loam, reddish yellow (5YR 6/6) moist; massive; hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; violently effervescent; calcium carbonate disseminated throughout and few medium nodules; moderately alkaline.

Depth to the calcic horizon ranges from 21 to 30 inches. The upper part of the profile commonly is leached of calcium carbonate to a depth of 14 to 24 inches.

The A horizon has hue of 10YR or 5YR, value of 4 or 5 when dry, and chroma of 3 or 4.

The Bt horizon has hue of 7.5YR or 5YR, value of 4 to 6 when dry and 3 to 5 when moist, and chroma of 3 to 6.

The Bk horizon has hue of 7.5YR or 5YR, value of 6 to 8 when dry and 4 to 6 when moist, and chroma of 4 to 6. Calcium carbonate equivalent ranges from 15 to 35 percent.

Darvey Series

The soils in the Darvey series are classified as fine-loamy, mixed, mesic Ustollic Calciorthids. These deep, well drained soils formed in calcareous alluvium derived mainly from limestone. They are on uplands. Slope is 0 to 5 percent. Elevation is 4,700 to 5,400 feet. The average annual precipitation is 12 to 14 inches. The average annual air temperature is 55 to 57 degrees F, and the frost-free period is 160 to 180 days.

Typical pedon of Darvey loam, 0 to 5 percent slopes; about 5 miles northwest of Mesa; 2,500 feet west and 1,000 feet north of the southeast corner of sec. 30, T. 3 S., R. 21 E.

A—0 to 6 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many fine and very fine roots; moderately alkaline; gradual wavy boundary.

Bk1—6 to 13 inches; brown (7.5YR 5/4) loam, brown (7.5YR 5/4) moist; moderate fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; strongly effervescent; few small soft masses of calcium carbonate; moderately alkaline; gradual wavy boundary.

Bk2—13 to 28 inches; light brown (7.5YR 6/4) loam, brown (7.5YR 5/4) moist; moderate fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; strongly effervescent; common medium soft masses and few fine filaments of calcium carbonate; moderately alkaline; abrupt smooth boundary.

Bk1—28 to 35 inches; pinkish white (7.5YR 8/2) clay loam, pink (7.5YR 7/4) moist; massive; very hard, firm, slightly sticky and slightly plastic; violently effervescent; many large soft masses of calcium carbonate; moderately alkaline; gradual wavy boundary.

Bk2—35 to 60 inches; pink (7.5YR 8/4) clay loam, light brown (7.5YR 6/4) moist; massive; hard, firm, slightly sticky and slightly plastic; violently effervescent; common medium soft masses of calcium carbonate; moderately alkaline.

Depth to the zone of maximum calcium carbonate accumulation ranges from 24 to 32 inches.

The A horizon has hue of 7.5YR or 10YR, value of 3 or 4 when moist, and chroma of 3 or 4.

The upper part of the Bk horizon has hue of 7.5YR or 10YR, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 3 or 4. The lower part of the Bk horizon has hue of 7.5YR or 10YR, value of 6 to 8 when dry and 5 to 7 when moist, and chroma of 2 to 4. Texture is loam or clay loam. Calcium carbonate equivalent ranges from 20 to 35 percent.

Deama Series

The soils in the Deama series are classified as loamy-skeletal, carbonatic, mesic Lithic Calciustolls. These shallow, well drained soils formed in residuum derived mainly from limestone. They are on limestone ridges and hillsides. Slope is 1 to 10 percent. Elevation is 4,700 to 5,000 feet. The average annual precipitation is 12 to 14 inches. The average annual air temperature is 55 to 57 degrees F, and the frost-free period is 160 to 180 days.

Typical pedon of a Deama gravelly loam in an area of Deama-Darvey association, 1 to 10 percent slopes; about 9 miles northwest of Mesa; 100 feet south and 50 feet east of the northwest corner of sec. 18, T. 3 S., R. 21 E.

A—0 to 7 inches; grayish brown (10YR 5/2) gravelly loam, dark brown (10YR 3/3) moist; moderate fine granular structure; soft, very friable, slightly sticky and nonplastic; many fine and very fine roots; 30 percent pebbles; violently effervescent; disseminated calcium carbonate; moderately alkaline; clear smooth boundary.

Bk—7 to 13 inches; light brownish gray (10YR 6/2) extremely gravelly loam, brown (10YR 4/3) moist; moderate fine granular structure; soft, very friable, slightly sticky and nonplastic; many fine and very fine roots; 45 percent pebbles and 20 percent cobbles; violently effervescent; disseminated calcium carbonate; many medium soft masses of calcium carbonate and coatings of calcium carbonate on bottom of rocks; moderately alkaline.

R—13 inches; limestone.

Depth to limestone ranges from 13 to 16 inches.

The A horizon has value of 4 or 5 when dry and chroma of 2 or 3.

Friona Series

The soils in the Friona series are classified as fine-loamy, mixed, thermic Petrocalcic Paleustolls. These moderately deep, well drained soils formed in alluvium derived mainly from the Ogallala Formation. They are on mesas. Slope is 0 to 3 percent. Elevation is 4,500 to 4,900 feet. The average annual precipitation is 14 to 16 inches. The average annual air temperature is 58 to 60 degrees F, and the frost-free period is 180 to 200 days.

Typical pedon of Friona sandy clay loam, 0 to 3 percent slopes; about 9 miles north and 2 miles east of Taiban; about 100 feet north and 50 feet east of the southwest corner of sec. 13, T. 4 N., R. 28 E.

A—0 to 6 inches; reddish brown (5YR 4/3) sandy clay loam, dark reddish brown (5YR 3/3) moist; moderate medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots, mildly alkaline; clear smooth boundary.

Bt1—6 to 11 inches; reddish brown (5YR 4/3) sandy clay loam, dark reddish brown (5YR 3/3) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; common moderately thick clay films on faces of peds; mildly alkaline; clear smooth boundary.

Bt2—11 to 18 inches; reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/3) moist; moderate medium prismatic structure parting to strong medium subangular blocky; very hard, friable, sticky and plastic; common fine and very fine roots; many moderately thick clay films on faces of peds; moderately alkaline; clear smooth boundary.

Btk—18 to 26 inches; reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4) moist; moderate medium subangular blocky structure; very hard, friable, sticky and plastic; common fine and very fine roots; common moderately thick clay films on faces of peds; strongly effervescent; few fine threads of calcium carbonate; moderately alkaline; abrupt wavy boundary.

Bkm—26 inches; white indurated caliche.

Thickness of the mollic epipedon generally ranges from 10 to 20 inches, but it may be as thin as 7 inches in some eroded areas. Depth to indurated caliche ranges from 20 to 40 inches.

The Bt horizon has value of 4 or 5 when dry and 3 to 5 when moist, and it has chroma of 3 or 4.

The Friona soils in this survey area receive less rainfall than is typical for the Friona series. This difference, however, does not significantly affect use and management.

Gallen series

The soils in the Gallen series are classified as loamy-skeletal, mixed, thermic Ustollic Calciorthids. These deep, well drained soils formed in alluvium derived mainly from gravelly, calcareous material. They are on uplands. Slope is 2 to 35 percent. Elevation is 4,000 to 5,000 feet. The average annual precipitation is 13 to 15 inches. The average annual air temperature is 58 to 60 degrees F, and the frost-free period is 180 to 200 days.

Typical pedon of a Gallen gravelly sandy loam in an area of Ima-Gallen association, 2 to 7 percent slopes; about 6 miles south of Fort Sumner; 500 feet west of the southeast corner of sec. 16, T. 2 N., R. 26 E.

A—0 to 5 inches; reddish brown (5YR 5/4) gravelly sandy loam, reddish brown (5YR 4/4) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; 20 percent pebbles; violently effervescent;

disseminated calcium carbonate; moderately alkaline; abrupt smooth boundary.

Bw—5 to 20 inches; reddish brown (5YR 5/3) very gravelly sandy loam, reddish brown (5YR 4/3) moist; moderate medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine roots; 35 percent pebbles and 15 percent cobbles; violently effervescent; disseminated calcium carbonate; moderately alkaline; clear wavy boundary.

Bk—20 to 60 inches; light reddish brown (5YR 6/4) extremely gravelly sandy loam with strata of extremely gravelly loamy sand and extremely gravelly fine sandy loam, reddish brown (5YR 5/4) moist; massive; soft, very friable, nonsticky and nonplastic; few fine and very fine roots; 45 percent pebbles and 20 percent cobbles; violently effervescent; disseminated calcium carbonate and coatings of calcium carbonate on rocks; moderately alkaline.

The A horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 or 5, and chroma of 3 or 4. It is gravelly sandy loam, gravelly loam, or very gravelly sandy loam.

The Bw horizon has hue of 5YR or 7.5YR, value of 4 to 6 when dry and 4 or 5 when moist, and chroma of 3 or 4. It is very gravelly loam or very gravelly sandy loam.

The Bk horizon has hue of 5YR or 7.5YR, value of 5 to 7 when dry and 4 or 5 when moist, and chroma of 2 to 4. It is extremely gravelly sandy loam, extremely gravelly fine sandy loam, very gravelly loamy sand, or extremely gravelly sand.

Hassell Series

The soils in the Hassell series are classified as fine, mixed, thermic Ustollic Haplargids. These moderately deep, well drained soils formed in residuum derived mainly from red-bed shale. They are below escarpments on hillsides. Slope is 0 to 5 percent. Elevation is 4,000 to 5,000 feet. The average annual precipitation is 13 to 15 inches. The average annual air temperature is 58 to 60 degrees F, and the frost-free period is 180 to 200 days.

Typical pedon of a Hassell clay loam in an area of Tucumcari-Hassell clay loams, 0 to 5 percent slopes; about 22 miles south of Fort Sumner; 2,100 feet south and 2,100 feet east of the northwest corner of sec. 9, T. 2 S., R. 26 E.

A—0 to 5 inches; red (2.5YR 5/6) clay loam, weak red (2.5YR 4/2) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; strongly effervescent; disseminated calcium carbonate; mildly alkaline; clear smooth boundary.

Bw—5 to 9 inches; light reddish brown (2.5YR 6/4) clay loam, reddish brown (2.5YR 4/4) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; strongly effervescent; disseminated calcium carbonate; moderately alkaline; clear smooth boundary.

Bt1—9 to 21 inches; reddish brown (2.5YR 4/4) clay, dark reddish brown (2.5YR 3/4) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; common very fine roots; common thin clay films on faces of peds; strongly effervescent; disseminated calcium carbonate; moderately alkaline; gradual smooth boundary.

Bt2—21 to 32 inches; reddish brown (2.5YR 4/4) clay, dark reddish brown (2.5YR 3/4) moist; weak coarse and medium subangular blocky structure; hard, firm, sticky and plastic; few very fine roots; many moderately thick clay films on faces of peds; strongly effervescent; disseminated calcium carbonate; moderately alkaline; gradual smooth boundary.

Cr—32 to 45 inches; reddish brown (2.5YR 5/4) shale, reddish brown (2.5YR 4/4) moist.

Depth to shale ranges from 20 to 40 inches.

Holloman Series

The soils in the Holloman series are classified as loamy, gypsic, thermic, shallow Typic Torriorthents. These very shallow and shallow, well drained soils formed in residuum derived mainly from gypsiferous material. They are on uplands. Slope is 1 to 25 percent. Elevation is 3,800 to 5,200 feet. The average annual precipitation is 13 to 15 inches. The average annual air temperature is 58 to 60 degrees F, and the frost-free period is 180 to 200 days.

Typical pedon of a Holloman loam in an area of Holloman-Rock outcrop complex, 15 to 35 percent slopes; about 9 miles east and 3 miles north of Dunlap; 800 feet north of the southeast corner of sec. 7, T. 2 S., R. 24 E.

A—0 to 3 inches; yellowish brown (10YR 5/4) loam, dark yellowish brown (10YR 4/4) moist; moderate medium platy structure; soft, very friable, slightly sticky and slightly plastic; violently effervescent; disseminated calcium carbonate; moderately alkaline; abrupt smooth boundary.

C—3 to 13 inches; light gray (5Y 7/2) loam, light olive gray (5Y 6/2) moist; moderate fine angular blocky structure; hard, friable, slightly sticky and nonplastic; violently effervescent; disseminated calcium carbonate; moderately alkaline; clear smooth boundary.

R—13 inches; gypsum.

The depth to gypsum ranges from 5 to 20 inches.

The A horizon has hue of 5YR to 10YR, value of 5 to 7 when dry and 4 to 6 when moist, and chroma of 2 to 4. It is loam or silt loam.

The C horizon has hue of 2.5YR to 5Y, value of 5 to 8 when dry and 3 to 7 when moist, and chroma of 2 to 6.

The Holloman soils in this survey area are moist for a longer period than is defined in the range for the Holloman series. This difference, however, does not significantly affect use and management.

Ima Series

The soils in the Ima series are classified as coarse-loamy, mixed, thermic Ustollic Camborthids. These deep, well drained soils formed in alluvium derived mainly from sandstone and shale. They are on hillsides and terraces. Slope is 0 to 5 percent. Elevation is 3,800 to 4,900 feet. The average annual precipitation is 13 to 15 inches. The average annual air temperature is 58 to 60 degrees F, and the frost-free period is 180 to 200 days.

Typical pedon of Ima fine sandy loam, 0 to 3 percent slopes; about 2 miles east and 1 mile south of Fort Sumner; 1,400 feet west and 20 feet north of the southeast corner of sec. 27, T. 3 N., R. 26 E.

Ap—0 to 10 inches; reddish brown (5YR 4/4) fine sandy loam, dark reddish brown (5YR 3/4) moist; moderate fine granular structure; slightly hard, very friable, nonsticky and nonplastic; many fine and very fine roots and common medium roots; strongly effervescent; disseminated calcium carbonate; mildly alkaline; clear smooth boundary.

Bw—10 to 36 inches; reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, friable, nonsticky and nonplastic; many fine and very fine roots and common medium roots; strongly effervescent; disseminated calcium carbonate; moderately alkaline; gradual smooth boundary.

Bk—36 to 40 inches; reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common fine and very fine roots and few medium roots; violently effervescent; few thin mycelia and few rounded soft masses of calcium carbonate; moderately alkaline; gradual smooth boundary.

C—40 to 60 inches; light reddish brown (5YR 6/4) sandy loam, reddish brown (5YR 5/4) moist; massive; slightly hard, friable, nonsticky and nonplastic; common fine and very fine roots and few medium roots; violently effervescent; disseminated calcium carbonate; moderately alkaline.

The A horizon has hue of 5YR or 7.5YR, value of 4 to 6 when dry and 3 to 5 when moist, and chroma of 2 to 4.

The B horizon has hue of 5YR or 7.5YR, value of 5 to 7 when dry and 4 to 6 when moist, and chroma of 3 to 6.

The C horizon has hue of 5YR or 7.5YR and value of 5 to 7 when dry and 3 to 6 when moist. It is fine sandy loam or sandy loam.

Kolar Series

The soils in the Kolar series are classified as loamy, mixed, thermic, shallow Ustollic Paleorthids. These very shallow and shallow, well drained soils formed in calcareous alluvial and eolian material derived from mixed sources. They are on mesas. Slope is 0 to 5 percent. Elevation is 4,000 to 5,200 feet. The average annual precipitation is 13 to 15 inches. The average annual air temperature is 58 to 60 degrees F, and the frost-free period is 180 to 200 days.

Typical pedon of a Kolar very fine sandy loam in an area of Kolar-Chispa-Neso association, 0 to 5 percent slopes; about 12 miles south and 1 mile west of Taiban. 2,250 feet south and 125 feet west of the northeast corner of sec. 5, T. 1 S., R. 28 E.

A—0 to 4 inches; brown (7.5YR 5/4) very fine sandy loam, dark brown (7.5YR 3/4) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; many fine and very fine roots; violently effervescent; disseminated calcium carbonate; moderately alkaline; clear smooth boundary.

Bw—4 to 11 inches; brown (7.5YR 5/4) very fine sandy loam, brown (7.5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; many fine and very fine roots; violently effervescent; disseminated calcium carbonate; moderately alkaline; clear wavy boundary.

Bk—11 to 18 inches; light brown (7.5YR 6/4) gravelly very fine sandy loam, brown (7.5YR 5/4) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many fine and very fine roots; violently effervescent; many medium nodules of calcium carbonate; moderately alkaline; abrupt wavy boundary.

Bkm—18 inches; white indurated caliche several feet thick over soft caliche.

Depth to indurated caliche ranges from 9 to 20 inches. The control section ranges from 9 to 18 percent clay.

The A horizon has hue of 5YR to 10YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 3 or 4. Texture is fine sandy loam, very fine sandy loam, or loamy fine sand.

The Bw and Bk horizons have hue of 5YR to 10YR, value of 5 to 8 when dry and 4 to 6 when moist, and chroma of 2 to 4. Texture is fine sandy loam or very fine

sandy loam. Some pedons have 10 to 35 percent coarse fragments.

The Bkm horizon typically is more than 12 inches thick, and it is as much as 60 inches thick in some pedons.

La Lande Series

The soils in the La Lande series are classified as fine-loamy, mixed, thermic Ustollic Camborthids. These deep, well drained soils formed in alluvium derived mainly from sandstone and shale. They are on alluvial terraces. Slope is 0 to 1 percent. Elevation is 3,900 to 4,100 feet. The average annual precipitation is 13 to 15 inches. The average annual air temperature is 58 to 60 degrees F, and the frost-free period is 180 to 200 days.

Typical pedon of La Lande fine sandy loam, 0 to 1 percent slopes; about 1 mile east of Fort Sumner; 1,600 feet west and 900 feet south of the northeast corner of sec. 28, T. 3 N., R. 26 E.

Ap—0 to 10 inches; reddish brown (5YR 5/4) fine sandy loam, dark reddish brown (5YR 3/4) moist; moderate fine granular structure; slightly hard, friable, nonsticky and nonplastic; many fine and very fine roots and common medium roots; strongly effervescent; disseminated calcium carbonate; mildly alkaline; clear smooth boundary.

Bw—10 to 24 inches; reddish brown (2.5YR 5/4) sandy clay loam, reddish brown (2.5YR 4/4) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many fine and very fine roots and common medium roots; violently effervescent; disseminated calcium carbonate; moderately alkaline; gradual smooth boundary.

Bkl—24 to 32 inches; reddish brown (2.5YR 5/4) sandy clay loam, reddish brown (2.5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common fine and very fine roots and few medium roots; violently effervescent; few fine rounded soft masses and mycelia of calcium carbonate; moderately alkaline; gradual smooth boundary.

Bk2—32 to 60 inches; reddish brown (2.5YR 5/4) sandy clay loam, reddish brown (2.5YR 4/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots and few medium roots; violently effervescent; few fine rounded soft masses of calcium carbonate; moderately alkaline.

The A and Bw horizons are 20 to 40 inches thick. The control section is 18 to 35 percent clay. Calcium carbonate equivalent ranges from 1 to 15 percent.

The A horizon has hue of 5YR or 7.5YR, and it has value of 4 to 6 when dry. It is fine sandy loam or sandy clay loam.

The Bw horizon has hue of 2.5YR to 7.5YR, value of 4 to 6 when dry and 3 to 5 when moist, and chroma of 4 to 6. Texture is clay loam or sandy clay loam.

The Bk horizon has hue of 2.5YR or 5YR, value of 5 to 7 when dry and 4 or 5 when moist, and chroma of 4 or 6. Sand and gravel are at a depth of 40 to 60 inches in some pedons.

Latom Series

The soils in the Latom series are classified as loamy, mixed, (calcareous), thermic Lithic Ustic Torriorthents. These very shallow and shallow, well drained soils formed in residuum derived mainly from sandstone. They are on ridges and hillsides. Slope is 0 to 40 percent. Elevation is 3,800 to 5,200 feet. The average annual precipitation is 13 to 15 inches. The average annual air temperature is 58 to 60 degrees F, and the frost-free period is 180 to 200 days.

Typical pedon of a Latom fine sandy loam in an area of Regnier-Latom-Rock outcrop complex, 1 to 15 percent slopes; about 5 miles east and 20 miles south of Fort Sumner; 300 feet north and 100 feet east of the southwest corner of sec. 6, T. 2 S., R. 27 E.

A—0 to 7 inches; pale brown (10YR 6/3) fine sandy loam, dark brown (10YR 3/3) moist; weak medium granular structure; soft, very friable, nonsticky and nonplastic; slightly effervescent; disseminated calcium carbonate; moderately alkaline; abrupt smooth boundary.

R—7 inches; grayish brown sandstone.

The depth to bedrock ranges from 5 to 20 inches.

The A horizon has hue of 10YR, 7.5YR, 5YR, or 2.5YR, value of 4 to 6 when dry and 3 to 5 when moist, and chroma of 3, 4, or 6. It generally is fine sandy loam, sandy loam, or gravelly fine sandy loam. In some areas the A horizon is loamy fine sand that overlies fine sandy loam.

The R horizon ranges in color from reddish brown to grayish brown. Hue is 2.5YR, 5YR, 7.5YR, or 10YR.

Los Tanos Series

The soils in the Los Tanos series are classified as coarse-loamy, mixed, thermic Ustochreptic Camborthids. These moderately deep, well drained soils formed in residuum derived mainly from sandstone. They are on uplands and ledges. Slope is 0 to 5 percent. Elevation is 4,000 to 5,200 feet. The average annual precipitation is 13 to 15 inches. The average annual air temperature is 58 to 60 degrees F, and the frost-free period is 180 to 200 days.

Typical pedon of a Los Tanos fine sandy loam in an area of Los Tanos-Latom fine sandy loams, 0 to 5 percent slopes; about 15 miles northwest of Yeso; 700

feet north and 1,000 feet east of the southwest corner of sec. 6, T. 4 N., R. 23 E.

A—0 to 5 inches; brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; many fine and very fine roots; mildly alkaline; abrupt smooth boundary.

Bw—5 to 11 inches; yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) moist; weak medium subangular blocky structure; slightly hard, friable, nonsticky and slightly plastic; many fine and very fine roots; moderately alkaline; clear wavy boundary.

Bk—11 to 21 inches; light reddish brown (5YR 6/4) fine sandy loam, reddish brown (5YR 5/4) moist; weak medium subangular blocky structure; slightly hard, friable, nonsticky and slightly plastic; common fine and very fine roots; violently effervescent; few fine threads and filaments of calcium carbonate; moderately alkaline; abrupt wavy boundary.

R—21 inches; hard sandstone.

The depth to bedrock ranges from 20 to 40 inches.

The A horizon has hue of 5YR or 7.5YR, value of 3 or 4 when moist, and chroma of 3 or 4.

The B horizon has value of 5 to 7 when dry and 3 to 5 when moist, and it has chroma of 4 or 6.

Some pedons have a highly calcareous horizon immediately above the unweathered bedrock.

The Los Tanos soils in this survey area have slightly more organic matter in the surface layer than is defined in the range for the Los Tanos series. This difference, however, does not significantly affect use and management.

Lozier Series

The soils in the Lozier series are classified as loamy-skeletal, carbonatic, thermic Lithic Calciorthids. These very shallow and shallow, well drained soils formed in residuum derived mainly from limestone. They are on upland ridges. Slope is 1 to 5 percent. Elevation is 4,000 to 4,500 feet. The average annual precipitation is 13 to 15 inches. The average annual air temperature is 58 to 60 degrees F, and the frost-free period is 180 to 200 days.

Typical pedon of a Lozier very gravelly loam in an area of Lozier-Rock outcrop complex, 1 to 5 percent slopes; about 7 miles west of Dunlap; 1,800 feet north and 1,200 feet east of the southwest corner of sec. 4, T. 3 S., R. 22 E.

A—0 to 3 inches; pale brown (10YR 6/3) very gravelly loam, brown (10YR 4/3) moist; moderate medium platy structure; slightly hard, very friable, nonsticky and nonplastic; many fine and very fine roots; 30 percent gravel and 10 percent cobbles; violently effervescent; disseminated calcium carbonate; moderately alkaline; clear smooth boundary.

Bk—3 to 13 inches; very pale brown (10YR 7/3) extremely cobbly loam, brown (10YR 5/3) moist; moderate fine granular structure; slightly hard, friable, nonsticky and nonplastic; many fine and very fine roots; 30 percent gravel and 35 percent cobbles; violently effervescent; disseminated calcium carbonate; moderately alkaline; abrupt wavy boundary.

R—13 inches; hard limestone.

Depth to limestone ranges from 7 to 16 inches.

The profile has value of 5 to 7 when dry and 4 to 6 when moist, and it has chroma of 3 or 4. Coarse fragment content ranges from 45 to 70 percent.

Minneosa Series

The soils in the Minneosa series are classified as sandy, mixed, thermic Ustic Torrifluvents. These deep, well drained soils formed in alluvium derived from sandstone and shale. They are on flood plains and terraces along the Pecos River. Slope is 0 to 2 percent. Elevation is 3,900 to 4,100 feet. The average annual precipitation is 13 to 15 inches. The average annual air temperature is 58 to 60 degrees F, and the frost-free period is 180 to 200 days.

Typical pedon of Minneosa fine sandy loam, 0 to 2 percent slopes; about 5 miles south and 2 miles east of Fort Sumner; 800 feet west and 20 feet north of the southeast corner of sec. 15, T. 2 N., R. 26 E.

Ap—0 to 8 inches; reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/3) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many fine and very fine roots; violently effervescent; disseminated calcium carbonate; mildly alkaline; clear smooth boundary.

C1—8 to 38 inches; light reddish brown (5YR 6/4) loamy fine sand, reddish brown (5YR 4/3) moist; single grain; loose; common fine and very fine roots; thin strata of fine sandy loam throughout; violently effervescent; disseminated calcium carbonate; mildly alkaline; clear smooth boundary.

IIC2—38 to 60 inches; light reddish brown (5YR 6/4) sand, reddish brown (5YR 5/4) moist; single grain; loose, very friable, nonsticky and nonplastic; few very fine roots; some rust stains on sand; grains violently effervescent; disseminated calcium carbonate; mildly alkaline.

The A horizon has chroma of 2 to 4. Texture is fine sandy loam or sandy clay loam.

The C horizon has hue of 5YR and 7.5YR, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 2 to 4. Texture is sand and loamy fine sand.

Montoya Series

The soils in the Montoya series are classified as fine, mixed, thermic Mollic Torrerts. These deep, well drained soils formed in alluvium derived mainly from red-bed shale and sandstone. They are on basin floors, toe slopes, and old oxbow lakebeds. Slope is 0 to 3 percent. Elevation is 3,900 to 4,500 feet. The average annual precipitation is 13 to 15 inches. The average annual air temperature is 58 to 60 degrees F, and the frost-free period is 180 to 200 days.

Typical pedon of a Montoya clay loam in an area of Tucumcari-Montoya clay loams, 0 to 3 percent slopes; about 19 miles south of La Lande; 2,000 feet north and 1,000 feet west of the southeast corner of sec. 30, T. 1 S., R. 27 E.

A—0 to 3 inches; reddish brown (2.5YR 4/4) clay loam, dark reddish brown (2.5YR 3/4) moist; moderate medium granular structure; slightly hard, friable, sticky and plastic; few fine medium roots; few cracks 1 centimeter wide; strongly effervescent; disseminated calcium carbonate; mildly alkaline; abrupt smooth boundary.

Bw1—3 to 10 inches; reddish brown (2.5YR 4/4) clay, dark reddish brown (5YR 3/4) moist; moderate very coarse prismatic structure parting to moderate medium angular blocky; very hard, very firm, very sticky and very plastic; few fine and medium roots; few cracks 1 centimeter wide; many slickensides; strongly effervescent; disseminated calcium carbonate; moderately alkaline; gradual wavy boundary.

Bw2—10 to 32 inches; dark reddish brown (2.5YR 3/4) clay, dark reddish brown (2.5YR 3/4) moist; moderate very coarse prismatic structure parting to moderate medium angular blocky; extremely hard, very firm, very sticky and very plastic; few very fine roots; common slickensides; few cracks 1 centimeter wide; strongly effervescent; disseminated calcium carbonate; moderately alkaline; gradual wavy boundary.

Bw3—32 to 60 inches; dark reddish brown (2.5YR 3/4) clay, dark reddish brown (2.5YR 3/4) moist; moderate very coarse prismatic structure parting to moderate medium angular blocky; extremely hard, very firm, very sticky and very plastic; few very fine and medium roots; few slickensides; strongly effervescent; disseminated calcium carbonate; moderately alkaline.

The A horizon has hue of 2.5YR to 7.5YR, and it has chroma of 3 or 4.

The Bw horizon has hue of 2.5YR to 7.5YR, value of 3 to 5 when dry and 3 or 4 when moist, and chroma of 3 to 6.

Montoya Variant

The Montoya Variant is classified as coarse-loamy over clayey, mixed, thermic Ustollic Camborthids. These deep, well drained soils formed in alluvium derived mainly from sandstone and shale. They are on alluvial terraces adjacent to oxbow lakes. Slope is 0 to 1 percent. Elevation is 3,900 to 4,100 feet. The average annual precipitation is 13 to 15 inches. The average annual air temperature is 58 to 60 degrees F, and the frost-free period is 180 to 200 days.

Typical pedon of Montoya Variant fine sandy loam, 0 to 1 percent slopes; about one-half mile south of Fort Sumner; 2,440 feet south and 1,270 feet east of the northwest corner of sec. 28, T. 3 N. R. 26 E.

Ap—0 to 10 inches; reddish brown (5YR 4/4) fine sandy loam, dark reddish brown (5YR 3/4) moist; moderate fine granular structure; slightly hard, friable, nonsticky and nonplastic; many fine and very fine roots; strongly effervescent; disseminated calcium carbonate; mildly alkaline; abrupt smooth boundary.

Bwl—10 to 18 inches; reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; many fine and very fine roots; strongly effervescent; disseminated calcium carbonate; mildly alkaline; clear smooth boundary.

2Bw2—18 to 24 inches; reddish brown (2.5YR 4/4) silty clay loam, dark red (2.5YR 3/6) moist; moderate medium subangular blocky structure; extremely hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; many pressure faces and slickensides; violently effervescent; disseminated calcium carbonate; mildly alkaline; clear smooth boundary.

2Bk1—24 to 38 inches; reddish brown (2.5YR 4/4) clay, dark red (2.5YR 3/6) moist; moderate medium subangular blocky structure; extremely hard, firm, very sticky and very plastic; many fine and very fine roots; many pressure faces and slickensides; few fine gypsum crystals; violently effervescent; few fine soft masses of calcium carbonate; moderately alkaline; clear smooth boundary.

2Bk2—38 to 60 inches; reddish brown (2.5YR 4/4) silty clay loam, red (2.5YR 4/6) moist; weak medium subangular blocky structure; extremely hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; few pressure faces; violently effervescent; few fine soft masses of calcium carbonate; moderately alkaline.

Depth to the upper boundary of the nonconforming cambic horizon ranges from 10 to 20 inches.

The A horizon has value of 4 or 5 when dry and 3 or 4 when moist, and it has chroma of 3 or 4. Texture is sandy clay loam or fine sandy loam.

The Bw and Bk horizons have value of 4 or 5 when dry and 3 or 4 when moist, and they have chroma of 4 or 6. Texture of the Bw horizon is fine sandy loam or sandy loam, and texture of the 2Bw and 2Bk horizons is silty clay loam or clay.

Neso Series

The soils in the Neso series are classified as loamy-skeletal, carbonatic, thermic, shallow Ustollic Paleorthids. These very shallow and shallow, well drained soils formed in hard caliche and loamy material derived from mixed sources. They are on ridges and knobs of mesas. Slope is 0 to 5 percent. Elevation is 4,000 to 5,200 feet. The average annual precipitation is 13 to 15 inches. The average annual air temperature is 58 to 60 degrees F, and the frost-free period is 180 to 200 days.

Typical pedon of a Neso very gravelly fine sandy loam in an area of Neso-Kolar association, 0 to 5 percent slopes; about 9 miles north and 4 miles east of Yeso; 2,100 feet east and 500 feet south of the northwest corner of sec. 16, T. 4 N., R. 23 E.

A—0 to 6 inches; brown (10YR 5/3) very gravelly fine sandy loam, dark brown (10YR 4/3) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; many fine and very fine roots; 15 percent cobbles and 30 percent gravel consisting of hard caliche; violently effervescent; disseminated calcium carbonate; moderately alkaline; clear smooth boundary.

Bk—6 to 12 inches; light brown (7.5YR 6/4) very cobbly fine sandy loam, brown (7.5YR 5/4) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; many fine and very fine roots; 25 percent cobbles and 35 percent gravel consisting of hard caliche; violently effervescent; disseminated calcium carbonate and deposits of calcium carbonate on bottom of coarse fragments; moderately alkaline; abrupt wavy boundary.

Bkm—12 inches; indurated caliche.

The depth to indurated caliche ranges from 8 to 14 inches. In areas that are gravelly, the A horizon is less than 5 inches thick and depth to the indurated caliche is more than 12 inches.

The A horizon has hue of 10YR or 7.5YR, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 3 or 4. Texture is gravelly or very gravelly fine sandy loam. Coarse fragment content ranges from 15 to 60 percent, of which 5 to 20 percent is cobbles and the rest is gravel.

The Bk horizon has hue of 10YR and 7.5YR, value of 5 to 7 when dry and 4 to 6 when moist, and chroma of 3 or 4. Coarse fragment content ranges from 35 to 65 percent. Texture is very gravelly, very cobbly, or extremely cobbly fine sandy loam.

The Bkm horizon commonly is 2 to 3 feet thick, but it is as thin as 6 or 8 inches and is underlain by very carbonatic loamy material.

Pastura Series

The soils in the Pastura series are classified as loamy, mixed, mesic, shallow Ustollic Paleorthids. These very shallow and shallow, well drained soils formed in calcareous alluvium derived from mixed sources. They are on mesas, knobs, and ridges. Slope is 0 to 10 percent. Elevation is 4,800 to 5,400 feet. The average annual precipitation is 12 to 14 inches. The average annual air temperature is 55 to 57 degrees F, and the frost-free period is 160 to 180 days.

Typical pedon of a Pastura loam in an area of Clovis-Pastura association, 0 to 5 percent slopes; about 3 miles east of Ramon; 1,500 feet east and 50 feet south of the northwest corner of sec. 9, T. I S., R. 20 E.

A—0 to 3 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; moderate thin platy structure; soft, very friable, nonsticky and nonplastic; many fine and very fine roots; violently effervescent; disseminated calcium carbonate; moderately alkaline; clear smooth boundary.

Bw—3 to 9 inches; light brownish gray (10YR 6/2) loam, grayish brown (10YR 5/2) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; many fine and very fine roots; violently effervescent; disseminated calcium carbonate; moderately alkaline; clear smooth boundary.

Bk—9 to 15 inches; light brownish gray (10YR 6/2) loam, brown (10YR 4/3) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; many fine and very fine roots; violently effervescent; common very hard masses of calcium carbonate; moderately alkaline; abrupt wavy boundary.

Bkm—15 inches; indurated caliche.

Depth to indurated caliche ranges from 7 to 20 inches. The profile has value of 5 or 6 when dry and 4 or 5 when moist, and it has chroma of 2 or 3.

Pojo Series

The soils in the Pojo series are classified as coarse-loamy, mixed, thermic Petrocalcic Ustollic Paleargids. These moderately deep, well drained soils formed in eolian and alluvial material derived from mixed sources. They are on mesas. Slope is 0 to 5 percent. Elevation is 3,900 to 5,200 feet. The average annual precipitation is 13 to 15 inches. The average annual air temperature is

58 to 60 degrees F, and the frost-free period is 180 to 200 days.

Typical pedon of Pojo loamy fine sand, 0 to 5 percent slopes; about 15 miles south of Taiban; 150 feet north and 2,300 feet west of the southeast corner of sec. 21, T. 1 S., R. 28 E.

A—0 to 9 inches; reddish brown (5YR 5/4) loamy fine sand, reddish brown (5YR 4/4) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many fine and very fine roots; moderately alkaline; clear smooth boundary.

Bt—9 to 21 inches; reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common very fine, fine, and medium roots; common thin clay films on faces of peds; moderately alkaline; clear wavy boundary.

Btk—21 to 25 inches; light reddish brown (5YR 6/4) fine sandy loam, reddish brown (5YR 5/4) moist; weak medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; many medium roots and few fine and very fine roots; common thin clay films on faces of peds; violently effervescent; disseminated calcium carbonate; moderately alkaline; abrupt wavy boundary.

Bkm—25 inches; white indurated caliche.

The depth to indurated caliche ranges from 20 to 40 inches.

The A horizon has hue of 5YR or 7.5YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 3 or 4. Texture is loamy fine sand or fine sandy loam.

The Bt horizon has value of 4 to 6 when dry and 3 to 5 when moist, and it has chroma of 4 to 8.

Poquita Series

The soils in the Poquita series are classified as fine-silty, mixed, thermic Ustollic Calciorthids. These deep, well drained soils formed in loamy alluvium derived mainly from sandstone and shale. They are on alluvial flats and toe slopes. Slope is 0 to 5 percent. Elevation is 4,000 to 4,700 feet. The average annual precipitation is 13 to 15 inches. The average annual air temperature is 58 to 60 degrees F, and the frost-free period is 180 to 200 days.

Typical pedon of Poquita very fine sandy loam, 0 to 5 percent slopes; about 4 miles north of Mesa; 2,000 feet south and 750 feet east of the northwest corner of sec. 29, T. 3 S., R. 22 E.

A—0 to 8 inches; brown (7.5YR 5/4) very fine sandy loam, dark brown (7.5YR 4/4) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many fine and very fine roots; slightly effervescent; disseminated calcium carbonate; mildly alkaline; clear smooth boundary.

Bk1—8 to 15 inches; yellowish red (5YR 5/6) loam, yellowish red (5YR 4/6) moist; moderate fine and medium subangular blocky structure; hard, friable, sticky and plastic; many fine and very fine roots; strongly effervescent; common small soft masses of calcium carbonate; moderately alkaline; clear wavy boundary.

Bk2—15 to 27 inches; pink (5YR 7/4) loam, yellowish red (5YR 4/6) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; common very fine roots; strongly effervescent; many small soft masses of calcium carbonate; moderately alkaline; abrupt wavy boundary.

Bk3—27 to 42 inches; pink (5YR 7/4) loam, yellowish red (5YR 5/6) moist; massive; very hard, friable, sticky and plastic; few very fine roots; violently effervescent; many large soft and hard masses of calcium carbonate; moderately alkaline; clear wavy boundary.

Bk4—42 to 60 inches; pink (5YR 7/4) loam, reddish yellow (5YR 6/6) moist; massive; very hard, friable, sticky and plastic; violently effervescent; common small soft masses of calcium carbonate; moderately alkaline.

Depth to horizons that have the highest calcium carbonate equivalent ranges from 20 to 40 inches.

The A horizon has value of 5 or 6 when dry and 4 or 5 when moist.

The Bk horizon has value of 5 to 7 when dry and 4 or 5 when moist, and it has chroma of 4 to 6.

Redona Series

The soils in the Redona series are classified as fine-loamy, mixed, thermic Ustollic Haplargids. These deep, well drained soils formed in alluvium derived mainly from sandstone and shale. They are on uplands, in broad valleys, and on toe slopes. Slope is 0 to 5 percent. Elevation is 3,800 to 5,000 feet. The average annual precipitation is 13 to 15 inches. The average annual air temperature is 58 to 60 degrees F, and the frost-free period is 180 to 200 days.

Typical pedon of Redona fine sandy loam, 0 to 2 percent slopes; about 10 miles south of Fort Sumner; 2,400 feet west and 90 feet north of the southwest corner of sec. 16, T. 1 N., R. 26 E.

Ap—0 to 7 inches; reddish brown (5YR 4/3) fine sandy loam, dark reddish brown (5YR 3/4) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; many fine and very fine roots; mildly alkaline; abrupt smooth boundary.

Bt1—7 to 15 inches; reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine

and very fine roots; common thin clay films on faces of peds and in pores; moderately alkaline; clear smooth boundary.

Bt2—15 to 24 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; common thin clay films on faces of peds and in pores; strongly effervescent; disseminated calcium carbonate; moderately alkaline; clear smooth boundary.

Btk—24 to 37 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; moderate medium subangular blocky structure; very hard, friable, sticky and plastic; common fine and very fine roots; common thin clay films on faces of peds and in pores; violently effervescent; few fine filaments and soft masses of calcium carbonate; moderately alkaline; abrupt wavy boundary.

Bk—37 to 60 inches; pink (5YR 7/3) sandy clay loam, light reddish brown (5YR 6/4) moist; weak medium subangular blocky structure; hard, friable, sticky and plastic; few fine and very fine roots; violently effervescent; common medium soft masses of calcium carbonate; moderately alkaline.

Depth to the calcic horizon ranges from 21 to 42 inches.

The A horizon has hue of 5YR or 7.5YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 2 to 4. It is fine sandy loam or sandy clay loam.

The Bt horizon has hue of 2.5YR or 5YR, value of 4 to 6 when dry and 3 to 5 when moist, and chroma of 4 or 6.

The Bk horizon has hue of 2.5YR or 5YR, value of 5 to 7 when dry and 4 to 6 when moist, and chroma of 3 to 8.

Reeves Series

The soils in the Reeves series are classified as fine-loamy, gypsic, thermic Typic Gypsiorthids. These soils are moderately deep to gypsum and are well drained. They formed in loamy alluvium derived mainly from gypsiferous material. These soils are in concave areas on uplands. Slope is 0 to 7 percent. Elevation is 4,000 to 5,000 feet. The average annual precipitation is 13 to 15 inches. The average annual air temperature is 58 to 60 degrees F, and the frost-free period is 180 to 200 days.

Typical pedon of a Reeves loam in an area of Holloman-Reeves complex, 1 to 15 percent slopes; about 7 miles south and 2 miles west of Yeso; 2,000 feet west and 500 feet south of the northeast corner of sec. 8, T. 1 N., R. 22 E.

A1—0 to 4 inches; brown (7.5YR 5/4) loam, dark brown (7.5YR 4/4) moist; weak very fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine roots; strongly effervescent; disseminated calcium carbonate; moderately alkaline; clear smooth boundary.

A2—4 to 15 inches; pink (7.5YR 7/4) loam, light brown (7.5YR 6/4) moist; weak coarse and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; many fine and very fine roots; strongly effervescent; disseminated calcium carbonate; moderately alkaline; clear wavy boundary.

Bk—15 to 35 inches; light brown (7.5YR 6/4) loam, brown (7.5YR 4/4) moist; massive; soft, very friable, nonsticky and slightly plastic; slightly effervescent; disseminated calcium carbonate; moderately alkaline; abrupt wavy boundary.

By—35 to 60 inches; light gray (10YR 7/2) gypsum, light brownish gray (10YR 6/2) moist; massive; very hard, very firm, nonsticky and nonplastic; few fine and very fine roots; violently effervescent; disseminated calcium carbonate; moderately alkaline.

The depth to gypsum ranges from 20 to 40 inches.

The A horizon has hue of 10YR or 7.5YR and value of 5 or 7 when dry and 4 or 6 when moist. Texture is loam or silt loam.

The Bk horizon has value of 5 or 6 when dry. It is loam or clay loam.

The By horizon has hue of 5YR or 10YR, value of 6 to 8 when dry and 5 to 7 when moist, and chroma of 2 or 3. It is 50 to 90 percent gypsum. This horizon is soft in some pedons.

Regnier Series

The soils in the Regnier series are classified as loamy, mixed, (calcareous), thermic, shallow Ustic Torriorthents. These shallow, well drained soils formed in residuum derived mainly from red-bed shale. They are on hillsides. Slope is 3 to 80 percent. Elevation is 3,800 to 5,100 feet. The average annual precipitation is 13 to 15 inches. The average annual air temperature is 58 to 60 degrees F, and the frost-free period is 180 to 200 days.

Typical pedon of a Regnier clay loam in an area of Regnier-Latom-Rock outcrop complex, 1 to 15 percent slopes; about 20 miles north of Fort Sumner; 300 feet west and 1,500 feet north of the southeast corner of sec. 19, T. 6 N., R. 26 E.

A—0 to 9 inches; reddish brown (2.5YR 5/4) clay loam, reddish brown (2.5YR 4/4) moist; strong fine granular structure; slightly hard, friable, sticky and plastic; many fine and very fine roots; violently effervescent; disseminated calcium carbonate; strongly alkaline; gradual smooth boundary.

C—9 to 18 inches; reddish brown (2.5YR 4/4) clay loam, dark reddish brown (2.5YR 3/4) moist; massive; hard, firm, sticky and plastic; common fine and very

fine roots; violently effervescent; disseminated calcium carbonate; strongly alkaline; clear wavy boundary.

Cr—18 to 36 inches; reddish brown (2.5YR 4/4) and light olive gray (5Y 6/2) stratified siltstone and shale; few very fine roots following cleavage planes to the shale.

The depth to shale ranges from 12 to 20 inches.

The A horizon has hue of 2.5YR or 5YR, and it has value of 4 or 5 when dry and 3 or 4 when moist. Texture is clay loam or gravelly sandy clay loam.

The C horizon has value of 4 or 5 when dry and 3 or 4 when moist. Texture is clay loam or sandy clay loam.

The Cr horizon varies widely in color according to parent material.

Roswell Series

The soils in the Roswell series are classified as mixed, thermic Ustic Torripsamments. These deep, excessively drained soils formed in eolian material derived mainly from sandstone and shale. They are on uplands, commonly on dunes. Slope is 3 to 20 percent. Elevation is 3,800 to 4,800 feet. The average annual precipitation is 13 to 15 inches. The average annual air temperature is 58 to 60 degrees F, and the frost-free period is 180 to 200 days.

Typical pedon of a Roswell fine sand in an area of Berwolf-Roswell association, 1 to 15 percent slopes; about 12 miles south of Taiban; 1,800 feet east and 1,100 feet north of southwest corner of sec. 36, T. 1 N., R. 27 E.

A—0 to 8 inches; brown (7.5YR 5/4) fine sand, brown (7.5YR 4/4) moist; single grain; loose; many fine and very fine roots; mildly alkaline; gradual smooth boundary.

C—8 to 60 inches; light reddish brown (5YR 6/4) fine sand, reddish brown (5YR 5/4) moist; single grain; loose; common fine and very fine roots; moderately alkaline.

The A horizon has hue of 5YR or 7.5R, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 4 to 6.

The C horizon has value of 5 or 6 when dry and 4 or 5 when moist, and it has chroma of 4 to 6.

San Jon Series

The soils in the San Jon series are classified as fine-loamy, mixed, thermic Ustochreptic Calciorthids. These moderately deep, well drained soils formed in alluvium and residuum derived mainly from the Seven Rivers Formation. They are on structural benches. Slope is 0 to 5 percent. Elevation is 3,900 to 4,800 feet. The average annual precipitation is 13 to 15 inches. The average annual air temperature is 58 to 60 degrees F, and the frost-free period is 180 to 200 days.

Typical pedon of San Jon loam, 0 to 5 percent slopes; about 7 miles east of Dunlap; 1,500 feet south and 500 feet west of the northeast corner of sec. 24, T. 2 S., R. 24 E.

A—0 to 8 inches; light brown (7.5YR 6/4) loam, brown (7.5YR 5/4) moist; moderate medium and fine subangular blocky structures; soft, very friable, slightly sticky and slightly plastic; many fine and very fine roots; strongly effervescent; disseminated calcium carbonate; moderately alkaline; clear smooth boundary.

Bk1—8 to 20 inches; pink (7.5YR 7/4) clay loam, light brown (7.5YR 6/4) moist; moderate medium and fine subangular blocky structure; hard, firm, sticky and plastic; many fine and very fine roots; violently effervescent; common medium soft masses of calcium carbonate; moderately alkaline; clear smooth boundary.

Bk2—20 to 33 inches; pink (7.5YR 7/4) clay loam, light brown (7.5YR 6/4) moist; moderate medium subangular blocky structure; hard, very firm, sticky and plastic; common very fine and few large roots; violently effervescent; many medium soft masses of calcium carbonate; strongly alkaline; abrupt wavy boundary.

2Cr—33 to 60 inches; light gray (2.5Y 7/2) fractured and layered shale, sandstone, and siltstone, light brownish gray (2.5Y 6/2) moist.

The depth to interbedded sandstone, shale, and siltstone ranges from 20 to 40 inches.

The 2Cr horizon has hue of 5YR to 5Y. Value and chroma are variable because of differences in the sandstone, shale, and siltstone.

Sharvana Series

The soils in the Sharvana series are classified as loamy, mixed, thermic, shallow Petrocalcic Ustalfic Paleargids. These shallow, well drained soils formed in calcareous, loamy alluvium derived from mixed sources. They are on ridges. Slope is 0 to 3 percent. Elevation is 4,400 to 5,000 feet. The average annual precipitation is 14 to 16 inches. The average annual air temperature is 58 to 60 degrees F, and the frost-free period is 180 to 200 days.

Typical pedon of a Sharvana fine sandy loam in an area of Sharvana-Slaughter association, 0 to 3 percent slopes; about 9 miles north and 3 miles west of Taiban; 530 feet south and 2,600 feet west of the northeast corner of sec. 14, T. 4 N., R. 28 E.

A—0 to 4 inches; brown (7.5YR 5/4) fine sandy loam, dark brown (7.5YR 3/4) moist; moderate very fine

granular structure; soft, very friable, nonsticky and nonplastic; many fine and very fine roots; mildly alkaline; clear smooth boundary.
Bt—4 to 13 inches; reddish brown (5YR 5/4) heavy fine sandy loam, reddish brown (5YR 4/4) moist; weak coarse prismatic structure parting to weak medium subangular blocky; hard, friable, nonsticky and slightly plastic; many fine and very fine roots; few thin clay films on faces of peds; moderately alkaline; abrupt wavy boundary.
Bkm—13 inches; white indurated caliche.

The depth to indurated caliche ranges from 10 to 20 inches.

The A horizon has hue of 5YR or 7.5YR and value of 3 or 4 when moist.

The B horizon is fine sandy loam or sandy clay loam.

The Sharvana soils in this survey area have slightly more organic matter in the A horizon than is defined in the range for the Sharvana series. This difference, however, does not significantly affect use and management.

Slaughter Series

The soils in the Slaughter series are classified as clayey, mixed, thermic, shallow Petrocalcic Paleustolls. These shallow, well drained soils formed in calcareous alluvium derived from mixed sources. They are in swales. Slope is 0 to 1 percent. Elevation is 4,400 to 5,000 feet. The average annual precipitation is 14 to 16 inches. The average annual air temperature is 58 to 60 degrees F, and the frost-free period is 180 to 200 days.

Typical pedon of a Slaughter sandy clay loam in an area of Sharvana-Slaughter association, 0 to 3 percent slopes; about 9 miles north and 3 miles west of Taiban; 1,300 feet west and 2,000 feet north of the southeast corner of sec. 7, T. 4 N., R. 28 E.

A—0 to 2 inches; reddish brown (5YR 5/3) sandy clay loam, dark reddish brown (5YR 3/3) moist; moderate thin platy structure; soft, very friable, slightly sticky and slightly plastic; many fine and very fine roots; mildly alkaline; abrupt smooth boundary.
Bt1—2 to 8 inches; reddish brown (5YR 5/3) clay loam, dark reddish brown (5YR 3/3) moist; moderate medium subangular blocky structure; extremely hard, friable, sticky and plastic; many fine and very fine roots; many moderately thick clay films on faces of peds; moderately alkaline; clear smooth boundary.
Bt2—8 to 17 inches; reddish brown (5YR 5/4) heavy clay loam, reddish brown (5YR 4/3) moist; strong medium angular blocky structure; extremely hard, friable, very sticky and very plastic; many fine and very fine roots; many moderately thick clay films on faces of peds; moderately alkaline; abrupt wavy boundary.
Bkm—17 inches; white indurated caliche several feet thick.

The depth to indurated caliche ranges from 10 to 20 inches.

Torriorthents

These soils are classified as Torriorthents. These deep, well drained soils formed in alluvium derived from mixed sources. They are on toe slopes. Slope is 15 to 35 percent. Elevation is 4,000 to 4,500 feet. The average annual precipitation is 13 to 15 inches. The average annual air temperature is 58 to 60 degrees F, and the frost-free period is 180 to 200 days.

Sample pedon of a Torriorthents gravelly fine sandy loam in an area of Gallen-Torriorthents association, 15 to 35 percent slopes; about 15 miles north and 10 miles west of Fort Sumner; in the center of sec. 6, T. 5 N., R. 24 E.

A—0 to 3 inches; brown (7.5YR 5/4) gravelly fine sandy loam, dark brown (7.5YR 4/4) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many fine and very fine roots; violently effervescent; disseminated calcium carbonate; moderately alkaline; abrupt wavy boundary.
C1—3 to 38 inches; light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4) moist; massive; slightly hard, friable, nonsticky and nonplastic; many fine and very fine roots; violently effervescent; disseminated calcium carbonate; moderately alkaline; clear wavy boundary.
C2—38 to 60 inches; light brown (7.5YR 6/4) very gravelly fine sandy loam, brown (7.5YR 5/4) moist; massive; slightly hard, friable, nonsticky and nonplastic; few fine and very fine roots; violently effervescent; disseminated calcium carbonate; moderately alkaline.

These soils range in texture from sand to clay. Colors vary widely because of differences in the various parent material.

Tucumcari Series

The soils in the Tucumcari series are classified as fine, mixed, thermic Ustollic Haplargids. These deep, well drained soils formed in alluvium derived mainly from red-bed shale and sandstone. They are on basin floors and in broad valleys. Slope is 0 to 5 percent. Elevation is 4,000 to 5,000 feet. The average annual precipitation is 13 to 15 inches. The average annual air temperature is 58 to 60 degrees F, and the frost-free period is 180 to 200 days.

Typical pedon of a Tucumcari clay loam in an area of Tucumcari-Montoya clay loams, 0 to 3 percent slopes; about 17 miles south of La Lande; 2,200 feet north and

1,100 feet east of the southwest corner of sec. 29, T. 1 S., R. 27 E.

A—0 to 5 inches; reddish brown (2.5YR 4/4) clay loam, dark reddish brown (2.5YR 3/4) moist; moderate fine granular structure; soft, very friable, sticky and plastic; many fine and very fine roots; strongly effervescent; disseminated calcium carbonate; moderately alkaline; clear smooth boundary.

Bt1—5 to 16 inches; reddish brown (2.5YR 4/4) clay, dark reddish brown (2.5YR 3/4) moist; moderate medium subangular blocky structure; hard, firm, very sticky and plastic; common fine roots; thin discontinuous clay films on faces of peds; strongly effervescent; disseminated calcium carbonate; moderately alkaline; gradual wavy boundary.

Bt2—16 to 30 inches; reddish brown (2.5YR 4/4) clay, dark reddish brown (2.5YR 3/4) moist; moderate medium and coarse subangular blocky structure; very hard, firm, very sticky and very plastic; few fine roots; thin discontinuous clay films on faces of peds; strongly effervescent; disseminated calcium carbonate; moderately alkaline; gradual wavy boundary.

Btk—30 to 45 inches; reddish brown (2.5YR 4/4) clay, dark reddish brown (2.5YR 3/4) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, friable, very sticky and very plastic; thin discontinuous clay films on faces of peds; strongly effervescent; few fine filaments of calcium carbonate; moderately alkaline; gradual wavy boundary.

Bk—45 to 60 inches; reddish brown (2.5YR 4/4) clay, dark reddish brown (2.5YR 3/4) moist; massive; very hard, firm, very sticky and plastic; strongly effervescent; few fine threads or filaments of calcium carbonate; moderately alkaline.

The A horizon has hue of 2.5YR or 5YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 3 or 4. It is clay loam or sandy clay loam.

The Bt horizon has hue of 2.5YR, 5YR, or 7.5YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 3 to 6. Texture is clay loam or clay.

The Bk horizon has hue of 2.5YR or 5YR, value of 4 or 5 when dry and 3 to 5 when moist, and chroma of 3 to 6.

Ustifluvents

These soils are classified as Ustifluvents. These deep, well drained to somewhat poorly drained soils formed in alluvium derived from mixed sources. They are on flood plains and alluvial terraces along the Pecos River and its major tributaries. Slope is 0 to 3 percent. Elevation is 3,700 to 4,800 feet. The average annual precipitation is 13 to 15 inches. The average annual air temperature is 58 to 60 degrees F, and the frost-free period is 180 to 200 days.

Reference pedon of Ustifluvents, 0 to 3 percent slopes; about 12 miles east of Dunlap; 1,500 feet west and 2,280 feet south of the northeast corner of sec. 22, T. 2 S., R. 25 E.

A—0 to 12 inches; reddish brown (2.5YR 5/4) fine sandy loam, reddish brown (2.5YR 4/4) moist; weak medium granular structure; soft, very friable, nonsticky and nonplastic; strongly effervescent; disseminated calcium carbonate; moderately alkaline; abrupt smooth boundary.

2C—12 to 21 inches; light reddish brown (2.5YR 6/4) gravelly loamy coarse sand, reddish brown (2.5YR 5/4) moist; single grain; loose, very friable, nonsticky and nonplastic; violently effervescent; disseminated calcium carbonate; moderately alkaline; clear wavy boundary.

3C1—21 to 26 inches; reddish brown (2.5YR 5/4) fine sandy loam, dark red (2.5YR 3/6) moist; massive; soft, very friable, slightly sticky and nonplastic; strongly effervescent; disseminated calcium carbonate; moderately alkaline; gradual wavy boundary.

3C2—26 to 31 inches; reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4) moist; massive; soft, very friable, slightly sticky and nonplastic; violently effervescent; disseminated calcium carbonate; moderately alkaline; clear smooth boundary.

4C1—31 to 38 inches; red (2.5YR 5/6) silty clay loam, dark red (2.5YR 3/6) moist; massive; hard, very firm, sticky and slightly plastic; violently effervescent; disseminated calcium carbonate; moderately alkaline; clear smooth boundary.

4C2—38 to 60 inches; reddish brown (2.5YR 5/4) clay loam, reddish brown (2.5YR 4/4) moist; massive; slightly hard, firm, sticky and slightly plastic; violently effervescent; disseminated calcium carbonate; moderately alkaline.

The profile is erratically stratified and ranges from sand and gravel to clay. Color varies widely because of the stratification of the alluvium.

Formation of the Soils

Soil is a natural, three-dimensional body on the Earth's surface that is capable of supporting plants. It consists of organic and mineral material and is the result of the interaction of the genetic and environmental factors of parent material, climate, plant and animal life, relief, and time. Each of these factors influences soil formation, and the effect of any one factor is modified by the other four.

Climate and plant and animal life are the active forces in soil formation. They act on the parent material, which in this survey area was originally a form of rock. The effects of climate, plant and animal life, and parent material are conditioned by relief. Finally, time is required for the development of distinct soil horizons.

The factors of soil formation are so closely interrelated that few generalizations can be made. Each factor as it occurs in this survey area is discussed in this section.

Parent Material

Parent material to a large degree determines the texture, structure, color, fertility, mineralogy, and chemical composition of a soil. Geologic formations of Permian, Triassic, Tertiary, and Quaternary age are the source of the parent material of the soils in this survey area (*3, 4*).

The soils in the southwestern part of the survey area and those along Salado Creek, in the northwestern part, formed in material derived mainly from limestone, shale, siltstone, and gypsum of Permian age. Examples of such soils are the very shallow and shallow Deama, Holloman, and Lozier soils; the moderately deep Reeves and San Jon soils; and the deep Darvey and Poquita soils.

The soils in the eastern part of the survey area on both sides and north of the Pecos River formed in material derived mainly from sandstone and shale of Triassic age. Examples of such soils are the very shallow and shallow Latom and Regnier soils; the moderately deep Hassell and Los Tanos soils; and the deep Montoya and Tucumcari soils.

The soils in the northeastern part of the survey area within the High Plains Major Land Resource Area formed in material derived mainly from the Ogallala Formation of Tertiary age. Examples of such soils, which typically are underlain by indurated caliche, are the shallow Sharvana and Slaughter soils and the moderately deep Friona soils.

The soils in the southeastern and western parts of the survey area and south of Fort Sumner, along the Pecos River and its major tributaries, formed in alluvium of Quaternary age. Examples of such soils in the western part of the survey area are the very shallow and shallow Kolar and Neso soils and the moderately deep Pojo soils. The soils in this part have had some eolian influence and are underlain by indurated caliche. Examples of soils that formed on uplands in the southeastern part of the survey area are the deep Armesa, Berwolf, Chispa, and Redona soils. Examples of soils that formed in more recent alluvium along the Pecos River and its major tributaries are the deep Gallen, Ima, La Lande, and Minneosa soils.

Climate

This survey area has a semiarid climate. The area is characterized by abundant sunshine, low relative humidity, erratic rainfall, strong wind, and a wide variation in daily and seasonal temperatures. Summers are long and hot, and winters usually are short and mild. The windiest time is late in winter and early in spring. The soils rarely are frozen to a depth of more than a few inches.

Climate has a direct influence on soil formation and is the most important factor in this survey area. Organic matter decomposes more rapidly in warm climates than in cold climates. Precipitation increases biological activity and thus increases the amount of organic matter produced. It also influences leaching and the movement of clay in soils.

Precipitation influences soil formation by entering the soil profile. In the soil, water enhances chemical reactions and the activity of micro-organisms and promotes plant growth. Water also moves downward in the soil and carries dissolved and suspended materials with it. These materials are deposited in the lower horizons.

The total precipitation in the survey area has not been sufficient to completely wet and leach the soils that have high available water capacity. In the Armesa and Chispa soils, partial leaching of calcium carbonate has taken place in the upper part of the soils, and calcium carbonate has accumulated at the normal depth of wetting. Some soils have been sufficiently wet over a long enough period of time that there has been leaching of calcium carbonate and translocation of clay minerals. The Redona soils are an example of soils that have an accumulation clay in the subsoil.

Wind has had a strong influence on soil formation in the southeastern part of the survey area. Strong winds have eroded or partially eroded the surface layer of many of the soils in the area. The Roswell soils are an example of soils that formed in redeposited sandy material.

Plant and Animal Life

Plants, large animals, micro-organisms, earthworms, and many other forms of life on or in the soil have an effect on soil formation. They provide organic matter, help to decompose plant and animal residue, affect the chemistry of soils, and mix the soil material. Large animals trample the soils, thus breaking the crusty surface and allowing more moisture to enter. Microorganisms also help to convert plant nutrients into a form that is available to higher plants.

Vegetation, mainly grasses, has had the greatest biologic influence on the soils in this survey area. Grasses draw soil nutrients and water from the soil and return residue for replenishment of the organic matter. This residue also helps to protect the soil from water erosion and soil blowing.

Where the precipitation is greater, as in the northwestern part of the survey area, the soils contain

more organic matter and produce more grass. Friona and Slaughter soils are examples of soils that have a higher content of organic matter.

Relief

Relief, shape, and slope of the landscape influence soil formation, mostly because of their effect on drainage, plant cover, soil temperature, surface runoff, and erosion. Changes in relief are relatively subtle in the survey area. The effect of slope on runoff has had the greatest influence on the general relief of the area.

Runoff and the risk of erosion are greater on sloping soils. As a result of less water entering the soil, less organic matter is produced and less development takes place within the soil profile. Soils in swales or concave areas receive more moisture in the form of runoff from higher lying soils. This additional moisture enters the profile and increases grass production, which increases the organic matter content of the surface layer and development of the profile. The Tucumcari and Redona soils are examples of soils that have greater development than adjacent soils because they receive additional moisture from runoff.

Exposure has had little effect on the formation of the soils in this survey area. In general, north-facing slopes are cooler than south-facing slopes. The effects of this are more evident in the more temperate areas and in areas that have greater relief.

Time

The length of time required for the formation of a given kind of soil depends largely upon the other factors of soil formation. An estimate of the age, or maturity, of a soil is based on the kind, thickness, and arrangement of genetic horizons. Generally, the greater the number of genetic horizons the older the soil.

Tucumcari soils are a good example of the interaction of the soil forming processes. These soils formed in fine textured alluvium derived from shale of Triassic age. There has been some accumulation of organic matter in the surface layer. Water percolating through the soil profile has weathered clay-forming minerals and has translocated the clay into the subsoil. Calcium carbonate has been leached downward.

Ima and La Lande soils are examples of young soils in the survey area. They formed in recent alluvium, have low organic matter content, and do not have a strongly developed subsoil.

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Glossary

Alluvial fan. The fanlike deposit of a stream where it issues from a gorge upon a plain or of a tributary stream near or at its junction with its main stream.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Animal-unit-month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3.5
Low	3.5 to 5.0
Moderate	5.0 to 7.5
High	7.5 to 10
Very high	More than 10

Back slope. The geomorphic component that forms the steepest inclined surface and principal element of many hillsides. Back slopes in profile are commonly steep, are linear, and may or may not include cliff segments.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Blowout. A shallow depression from which all or most of the soil material has been removed by wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Breaks. The steep to very steep broken land at the border of an upland summit that is dissected by ravines.

Brush management. Use of mechanical, chemical, or biological methods to reduce or eliminate competition of woody vegetation to allow understory grasses and forbs to recover, or to make conditions favorable for reseeding. It increases production of forage, which reduces erosion. Brush management may improve the habitat for some species of wildlife.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche. A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds just beneath the solum, or it is exposed at the surface by erosion.

Chemical treatment. Control of unwanted vegetation by use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter, in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Coarse fragments. Mineral or rock particles larger than 2 millimeters in diameter.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. If soil improving crops and practices used in the system more than offset the soil depleting crops and deteriorating practices, then it is a good conservation cropping system. Cropping systems are needed on all tilled soils. Soil improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—
Loose.—Noncoherent when dry or moist; does not hold together in a mass.
Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.
Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.
Plastic.—Readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.
Sticky.—Adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.
Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.
Soft.—When dry, breaks into powder or individual grains under very slight pressure.
Cemented.—Hard; little affected by moistening.

Contour stripcropping (or contour farming). Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cropping system. Growing crops using a planned system of rotation and management practices.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or arresting grazing for a prescribed period.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:
Excessively drained.—These soils have very high and high hydraulic conductivity and low water holding capacity. They are not suited to crop production unless irrigated.
Somewhat excessively drained.—These soils have high hydraulic conductivity and low water holding capacity. Without irrigation, only a narrow range of crops can be grown and yields are low.
Well drained.—These soils have intermediate water holding capacity. They retain optimum amounts of moisture, but they are not wet close enough to the surface or long enough during the growing season to adversely affect yields.
Moderately well drained.—These soils are wet close enough to the surface or long enough that planting or harvesting operations or yields of some field crops are adversely affected unless artificial drainage is provided. Moderately well drained soils commonly have a layer with low hydraulic conductivity, a wet layer relatively high in the profile, additions of water by seepage, or some combination of these.
Somewhat poorly drained.—These soils are wet close enough to the surface or long enough that planting or harvesting operations or crop growth is markedly restricted unless artificial drainage is provided. Somewhat poorly drained soils commonly have a layer with low hydraulic conductivity, a wet layer high in the profile, additions of water through seepage, or a combination of these.
Poorly drained.—These soils commonly are so wet at or near the surface during a considerable part of the year that field crops cannot be grown under natural conditions. Poorly drained conditions are caused by a saturated zone, a layer with low hydraulic conductivity, seepage, or a combination of these.
Very poorly drained.—These soils are wet to the surface most of the time. They are wet enough to prevent the growth of important crops (except rice) unless artificially drained.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy

material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.
Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature; for example, fire that exposes the surface.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and produced by erosion or faulting. Synonym: scarp.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess lime (in tables). Excess carbonates in the soil that restrict the growth of some plants.

Excess salts (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fine textured soil. Sandy clay, silty clay, and clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Fragile (in tables). A soil that is easily damaged by use or disturbance.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Grassed watery. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

High-residue crops. Crops such as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well-defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:
O horizon.—An organic layer of fresh and decaying plant residue.
A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.
B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, alluminum, or some combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the number 2 precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Knoll. A small, low, rounded hill rising above adjacent landforms.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low-residue crops. Crops such as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Low strength. The soil is not strong enough to support loads.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mesa. A broad, nearly flat topped and commonly isolated upland mass characterized by summit widths that are more than the heights of bounding erosional scarps.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mountain. A natural elevation of the land surface, rising more than 1,000 feet above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides and considerable bare-rock surface. A mountain can occur as a single, isolated mass or in a group forming a chain or range.

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color in hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Observed rooting depth. Depth to which roots have been observed to penetrate.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percs slowly (in tables). The slow movement of water through the soil, adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitting (in tables). Pits caused by melting around ice. They form on the soil after plant cover is removed.

Plateau. An extensive upland mass with relatively flat summit area that is considerably elevated (more than 100 meters) above adjacent lowlands and separated from them on one or more sides by escarpments.

Playa. The generally dry and nearly level lake plain that occupies the lowest parts of closed depressional areas, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff.

Poor filter (in tables). Because of rapid permeability or an impermeable layer near the surface, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Potential native plant community. The plant community on a given site that will be established if present environmental conditions continue to prevail and the site is properly managed. (See climax plant community.)

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This increases the vigor and reproduction of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range condition. The present composition of the plant community on a range site in relation to the

potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor on the basis of how much the present plant community has departed from the potential.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Red beds. Sedimentary strata mainly red in color and composed largely of sandstone and shale.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Root zone. The part of the soil that can be penetrated by plant roots.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Salty water (in tables.) Water that is too salty for consumption by livestock.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey the following slope classes are recognized:

	Percent
Nearly level	0 to 1
Gently sloping	1 to 5
Strongly sloping	5 to 15
Moderately steep	15 to 25
Steep	25 to 45
Very steep	45 and higher

Slope (in tables). Slope is great enough that special practices are required to insure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 6 to 15 inches (15 to 38 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, are in soils in extremely small amounts. They are essential to plant growth.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Table

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1902-82 at Fort Sumner, NM]

Month	Temperature		Precipitation	
	Average daily maximum	Average daily minimum	Average monthly total	Average number of days with 0.10 inch or more
	°F	°F	In	
January----	54	22	0.3	1
February---	59	26	0.4	1
March------	66	31	0.6	1
April------	75	41	0.7	2
May--------	84	50	1.2	3
June-------	92	60	1.3	3
July-------	94	64	2.6	5
August-----	92	62	2.4	4
September--	86	54	1.9	3
October----	76	42	1.3	3
November---	64	31	0.4	0
December---	56	24	0.4	1
Year-----	75	42	13.5	27

TABLE 2.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
12	Ima-Armesa association, 1 to 10 percent slopes	5,203	0.3
14	Kolar-Chispa-Neso association, 0 to 5 percent slopes	32,316	2.1
16	Roswell-Berwolf association, 3 to 20 percent slopes	26,751	1.8
17	Berwolf loamy fine sand, 0 to 5 percent slopes	70,763	4.7
21	Holloman-Rock outcrop complex, 15 to 35 percent slopes	26,129	1.7
24	Tucumcari-Montoya clay loams, 0 to 3 percent slopes	12,443	0.8
25	Chispa-Gallen association, 1 to 10 percent slopes	31,953	2.1
26	Holloman-Reeves complex, 1 to 15 percent slopes	90,248	6.0
27	Los Tanos-Latom fine sandy loams, 0 to 5 percent slopes	21,055	1.4
30	Ustifluvents, 0 to 3 percent slopes	27,931	1.9
31	Chispa-Redona association, 0 to 3 percent slopes	94,863	6.3
32	Friona sandy clay loam, 0 to 3 percent slopes	10,378	0.7
34	Gallen-Torriorthents association, 15 to 35 percent slopes	25,051	1.7
35	Tucumcari-Redona association, 0 to 3 percent slopes	28,859	1.9
36	Rock outcrop-Regnier-Latom complex, 30 to 80 percent slopes	21,026	1.4
37	Ima-Gallen association, 2 to 7 percent slopes	21,961	1.5
39	Sharvana-Slaughter association, 0 to 3 percent slopes	27,680	1.8
40	Pastura-Darvey association, 1 to 10 percent slopes	41,227	2.7
41	Clovis-Pastura association, 0 to 5 percent slopes	22,977	1.5
48	Berwolf-Sharvana association, 0 to 3 percent slopes	5,658	0.4
49	Pojo loamy fine sand, 0 to 5 percent slopes	10,048	0.7
50	Berwolf-Chispa-Armesa association, 0 to 5 percent slopes	50,623	3.4
51	Regnier-Latom-Rock outcrop complex, 1 to 15 percent slopes	68,253	4.5
52	Latom-Berwolf association, 0 to 10 percent slopes	4,248	0.3
53	Cardenas loamy fine sand, 1 to 15 percent slopes	4,960	0.3
55	Darvey loam, 0 to 5 percent slopes	21,308	1.4
56	Tucumcari-Hassell clay loams, 0 to 5 percent slopes	10,329	0.7
57	Latom-Rock outcrop complex, 3 to 20 percent slopes	15,603	1.0
58	Redona-Armesa association, 0 to 5 percent slopes	43,002	2.8
59	Chispa-Los Tanos fine sandy loams, 0 to 5 percent slopes	32,107	2.1
60	Chispa-Armesa-Redona association, 2 to 7 percent slopes	94,077	6.2
61	Berwolf-Roswell association, 1 to 15 percent slopes	29,983	2.0
62	Regnier-Latom-Rock outcrop complex, 15 to 35 percent slopes	16,844	1.1
63	Neso-Kolar association, 0 to 5 percent slopes	56,065	3.7
64	Berwolf fine sandy loam, 0 to 5 percent slopes	22,703	1.5
66	Pojo-Kolar loamy fine sands, 0 to 5 percent slopes	62,236	4.1
67	Kolar-Neso-Pojo complex, 0 to 5 percent slopes	98,595	6.5
68	Poquita very fine sandy loam, 0 to 5 percent slopes	70,770	4.7
69	Deama-Darvey association, 1 to 10 percent slopes	11,351	0.8
71	San Jon loam, 0 to 5 percent slopes	20,394	1.4
72	Lozier-Rock outcrop complex, 1 to 5 percent slopes	6,516	0.4
73	Reeves-Holloman association, 0 to 5 percent slopes	85,802	5.7
102	Redona fine sandy loam, 0 to 2 percent slopes	2,439	0.2
103	Chispa fine sandy loam, 0 to 2 percent slopes	4,175	0.3
105	Montoya clay loam, 0 to 1 percent slopes	1,351	0.1
106	La Lande fine sandy loam, 0 to 1 percent slopes	330	*
107	Ima fine sandy loam, 0 to 3 percent slopes	3,513	0.2
108	Armesa loamy fine sand, 1 to 3 percent slopes	2,926	0.2
109	Armesa loamy fine sand, 3 to 5 percent slopes	951	0.1
110	Minneosa fine sandy loam, 0 to 2 percent slopes	489	*
111	La Lande sandy clay loam, gravelly substratum, 0 to 1 percent slopes	333	*
112	La Lande sandy clay loam, 0 to 1 percent slopes	905	0.1
113	Montoya Variant sandy clay loam, 0 to 1 percent slopes	550	*
114	Montoya Variant fine sandy loam, 0 to 1 percent slopes	466	*
115	Minneosa sandy clay loam, 0 to 1 percent slopes	721	0.1
116	Chispa sandy clay loam, 0 to 2 percent slopes	1,087	0.1
117	Berwolf loamy fine sand, 1 to 3 percent slopes	774	0.1
118	Berwolf fine sandy loam, 0 to 3 percent slopes	1,421	0.1
	Water	6,400	0.4
	Total	1,509,120	100.0

* Less than 0.1 percent.

TABLE 3.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF IRRIGATED CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil. Only the soils suited to crops and pasture are listed]

Soil name and map symbol	Land capability	Alfalfa hay	Wheat	Hay crops, annuals	Pasture	Corn
		Tons	Bu	Tons	AUM*	Bu
102---------- Redona	IIe	8.0	70	8.0	---	180
103---------- Chispa	IIe	7.5	70	8.0	---	180
105---------- Montoya	IVs	4.5	40	7.5	22	---
106---------- La Lande	IIe	7.5	70	8.0	25	---
107---------- Ima	IIIe	8.0	50	8.0	20	---
108, 109---------- Armesa	IVe	3.5	30	5.0	---	90
110---------- Minneosa	IVs	5.0	30	6.0	15	---
111---------- La Lande	IIIs	6.0	50	6.5	18	---
112---------- La Lande	IIe	6.5	50	8.0	20	---
113---------- Montoya Variant	IIIs	5.0	45	7.0	22	---
114---------- Montoya Variant	IIIs	7.5	45	8.0	25	---
115---------- Minneosa	IIIs	5.0	45	6.5	15	---
116---------- Chispa	IIe	6.0	40	7.0	---	160
117---------- Berwolf	IVe	8.0	55	7.0	---	140
118---------- Berwolf	IIIe	8.0	60	8.0	---	150

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

TABLE 4.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

[Only the soils suited to windbreaks and environmental plantings are listed]

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
102---------- Redona	Fourwing saltbush	Pinyon, lilac	White fir, Austrian pine, eastern redcedar, Rocky Mountain juniper, ponderosa pine.	Green ash, King Red Russian-olive.	Siberian elm, Lombardy poplar.
103---------- Chispa	Fourwing saltbush	Skunkbush sumac, pinyon, lilac, Amur honeysuckle.	Eastern redcedar, green ash, Rocky Mountain juniper, golden willow, honeylocust.	King Red Russian-olive.	Siberian elm.
105---------- Montoya	Lilac, fourwing saltbush.	Austrian pine, Siberian elm, eastern redcedar, green ash, skunkbush sumac, Osageorange, American plum, Rocky Mountain juniper, King Red Russian-olive.	Russian mulberry	---	---
106---------- La Lande	Fourwing saltbush	Pinyon, skunkbush sumac, lilac, Amur honeysuckle.	Eastern redcedar, Rocky Mountain juniper, golden willow, honeylocust, green ash.	King Red Russian-olive.	Siberian elm.
107---------- Ima	Fourwing saltbush	Pinyon, American plum, lilac, Amur honeysuckle.	Eastern redcedar, Rocky Mountain juniper, Douglas-fir.	Green ash, honeylocust, King Red Russian-olive.	Siberian elm.
108, 109---------- Armesa	Fourwing saltbush	Amur honeysuckle, pinyon, lilac, American plum.	Eastern redcedar, Rocky Mountain juniper, green ash, honeylocust, osageorange.	Siberian elm, King Red Russian-olive.	---
110---------- Minneosa	Fourwing saltbush	Pinyon, American plum, lilac, Amur honeysuckle.	Eastern redcedar, Rocky Mountain juniper, Douglas-fir.	Green ash, honeylocust, King Red Russian-olive.	Siberian elm.
111---------- La Lande	Fourwing saltbush, skunkbush sumac.	Eastern redcedar, Rocky Mountain juniper, ponderosa pine, pinyon, Siberian elm, green ash, hackberry.	Honeylocust, Russian mulberry, King Red Russian-olive.		---
112---------- La Lande	Fourwing saltbush	Pinyon, skunkbush sumac, lilac, Amur honeysuckle.	Eastern redcedar, Rocky Mountain juniper, golden willow, honeylocust, green ash.	King Red Russian-olive.	Siberian elm.

TABLE 4.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
113, 114---------- Montoya Variant	Fourwing saltbush	Skunkbush sumac, lilac, Amur honeysuckle.	Ponderosa pine, Rocky Mountain juniper, eastern redcedar, Austrian pine, Siberian elm, green ash, honeylocust, King Red Russian-olive.	---	---
115---------- Minneosa	Fourwing saltbush	Pinyon, American plum, lilac, Amur honeysuckle.	Eastern redcedar, Rocky Mountain juniper, Douglas-fir.	Green ash, honeylocust, King Red Russian-olive.	Siberian elm.
116---------- Chispa	Fourwing saltbush	Skunkbush sumac, pinyon, lilac, Amur honeysuckle.	Eastern redcedar, green ash honeylocust, golden willow, Rocky Mountain juniper.	King Red Russian-olive.	Siberian elm.
117, 118---------- Berwolf	Fourwing saltbush	Pinyon, American plum, lilac, Amur honeysuckle.	Eastern redcedar, Rocky Mountain juniper, Douglas-fir.	Green ash, honeylocust, King Red Russian-olive.	Siberian elm.

TABLE 5.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
12*:					
Ima	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Armesa	Slight	Slight	Moderate: slope.	Slight	Slight.
14*:					
Kolar	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: erodes easily.	Severe: thin layer.
Chispa	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Neso	Severe: cemented pan.	Severe: cemented pan.	Severe: small stones, cemented pan.	Slight	Severe: thin layer.
16*:					
Roswell	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Moderate: droughty, slope.
Berwolf	Slight	Slight	Moderate: slope.	Slight	Slight.
17 Berwolf	Slight	Slight	Moderate: slope.	Slight	Slight.
21*:					
Holloman	Severe: slope, depth to rock, excess salt.	Severe: slope, excess salt, depth to rock.	Severe: slope, depth to rock, excess salt.	Severe: erodes easily.	Severe: excess salt, slope, thin layer.
Rock outcrop.					
24*:					
Tucumcari	Slight	Slight	Slight	Slight	Slight.
Montoya	Severe: flooding.	Moderate: excess salt, percs slowly.	Moderate: percs slowly.	Severe: erodes easily.	Moderate: excess salt.
25*:					
Chispa	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.	Slight.
Gallen	Moderate: small stones.	Moderate: small stones.	Severe: slope, small stones.	Slight	Moderate: small stones, large stones.
26*:					
Holloman	Severe: depth to rock, excess salt.	Severe: excess salt, depth to rock.	Severe: slope, depth to rock, excess salt.	Severe: erodes easily.	Severe: excess salt, thin layer.

TABLE 5.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
26*: Reeves	Moderate: dusty, excess salt.	Moderate: excess salt, dusty.	Moderate: slope, dusty.	Severe: erodes easily.	Moderate: excess salt.
27*: Los Tanos	Slight	Slight	Moderate: slope, depth to rock.	Slight	Moderate: thin layer.
Latom	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Severe: thin layer.
30. Ustifluvents					
31*: Chispa	Slight	Slight	Moderate: small stones.	Slight	Slight.
Redona	Slight	Slight	Slight	Slight	Slight.
32---- Friona	Slight	Slight	Slight	Slight	Moderate: thin layer.
34*: Gallen	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones.	Severe: small stones, slope.
Torriorthents.					
35*: Tucumcari	Slight	Slight	Slight	Slight	Slight.
Redona	Slight	Slight	Slight	Slight	Slight.
36*: Rock outcrop.					
Regnier	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope, thin layer.
Latom	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, thin layer.
37*: Ima	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Gallen	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones,
39*: Sharvana	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Slight	Severe: thin layer.
Slaughter	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Slight	Severe: thin layer.

See footnote at end of table.

TABLE 5.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
40*:					
Pastura	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: erodes easily.	Severe: thin layer.
Darvey	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Severe: erodes easily.	Slight.
41*:					
Clovis	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Severe: erodes easily.	Slight.
Pastura	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: erodes easily.	Severe: thin layer.
48*:					
Berwolf	Slight	Slight	Slight	Slight	Slight.
Sharvana	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Slight	Severe: thin layer.
49--- Pojo	Slight	Slight	Moderate: slope, cemented pan.	Slight	Moderate: thin layer.
50*:					
Berwolf	Slight	Slight	Moderate: slope.	Slight	Slight.
Chispa	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Armesa	Slight	Slight	Moderate: slope.	Slight	Slight.
51*:					
Regnier	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Slight	Severe: thin layer.
Latom	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Slight	Severe: thin layer.
Rock outcrop.					
52*:					
Latom	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Severe: thin layer.
Berwolf	Slight	Slight	Moderate: slope.	Slight	Slight.
53--- Cardenas	Severe: cemented pan.	Severe: cemented pan.	Severe: slope, cemented pan.	Slight	Severe: thin layer.
55--- Darvey	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Severe: erodes easily.	Slight.
56*:					
Tucumcari	Slight	Slight	Moderate: slope.	Slight	Slight.

See footnote at end of table.

TABLE 5.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
56*:					
Hassell	Slight	Slight	Moderate: slope, depth to rock.	Slight	Moderate: thin layer.
57*:					
Latom	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Slight	Severe: thin layer.
Rock outcrop.					
58*:					
Redona	Slight	Slight	Moderate: slope.	Slight	Slight.
Armesa	Slight	Slight	Moderate: slope.	Slight	Slight.
59*:					
Chispa	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Los Tanos	Slight	Slight	Moderate: slope, depth to rock.	Slight	Moderate: thin layer.
60*:					
Chispa	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Armesa	Slight	Slight	Moderate: slope.	Slight	Slight.
Redona	Slight	Slight	Moderate: slope.	Slight	Slight.
61*:					
Berwolf	Slight	Slight	Moderate: slope.	Slight	Slight.
Roswell	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Moderate: droughty, slope.
62*:					
Regnier	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, thin layer.
62*:					
Latom	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Moderate: slope.	Severe: slope, thin layer.
Rock outcrop.					
63*:					
Neso	Severe: small stones, cemented pan.	Severe: small stones, cemented pan.	Severe: small stones, cemented pan.	Slight	Severe: small stones, thin layer.

See footnote at end of table.

TABLE 5.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
63*:					
Kolar	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Slight	Severe: thin layer.
64--- Berwolf	Slight	Slight	Moderate: slope.	Slight	Slight.
66*:					
Pojo	Slight	Slight	Moderate: slope, cemented pan.	Slight	Moderate: thin layer.
Kolar	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Slight	Severe: thin layer.
67*:					
Kolar	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Slight	Severe: thin layer.
Neso	Severe: small stones, cemented pan.	Severe: small stones, cemented pan.	Severe: small stones, cemented pan.	Slight	Severe: small stones, thin layer.
Pojo	Slight	Slight	Moderate: slope, cemented pan.	Slight	Moderate: thin layer.
68--- Poquita	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Severe: erodes easily.	Slight.
69*:					
Deama	Severe: depth to rock.	Severe: depth to rock.	Severe: small stones, depth to rock.	Slight	Severe: thin layer.
Darvey	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Severe: erodes easily.	Slight.
71--- San Jon	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Severe: erodes easily.	Moderate: thin layer.
72*:					
Lozier	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: small stones.	Severe: small stones, thin layer.
Rock outcrop.					
73*:					
Reeves	Moderate: dusty, excess salt.	Moderate: excess salt, dusty.	Moderate: slope, dusty.	Severe: erodes easily.	Moderate: excess salt.
Holloman	Severe: depth to rock, excess salt.	Severe: excess salt, depth to rock.	Severe: depth to rock, excess salt.	Severe: erodes easily.	Severe: excess salt, thin layer.
102--- Redona	Slight	Slight	Slight	Slight	Slight.

See footnote at end of table.

TABLE 5.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
103---------- Chispa	Slight----------	Slight----------	Moderate: small stones.	Slight----------	Slight.
105---------- Montoya	Moderate: percs slowly.	Moderate: excess salt, percs slowly.	Moderate: percs slowly.	Severe: erodes easily.	Moderate: excess salt.
106---------- La Lande	Slight----------	Slight----------	Slight----------	Slight----------	Slight.
107---------- Ima	Slight----------	Slight----------	Moderate: small stones.	Slight----------	Slight.
108, 109---------- Armesa	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
110---------- Minneosa	Slight----------	Slight----------	Slight----------	Slight----------	Moderate: droughty.
111, 112---------- La Lande	Slight----------	Slight----------	Slight----------	Slight----------	Slight.
113, 114---------- Montoya Variant	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight----------	Slight.
115---------- Minneosa	Slight----------	Slight----------	Slight----------	Slight----------	Slight.
116---------- Chispa	Slight----------	Slight----------	Moderate: small stones.	Slight----------	Slight.
117---------- Berwolf	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
118---------- Berwolf	Slight----------	Slight----------	Slight----------	Slight----------	Slight.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 6.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements						Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
12*:									
Ima	Poor	Fair	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair.
Armesa	Poor	Fair	Fair	Fair	Very poor	Very poor	Fair	Very poor	Fair.
14*:									
Kolar	Very poor	Very poor	Poor	Poor	Poor	Very poor	Very poor	Very poor	Poor.
Chispa	Poor	Poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair.
Neso	Very poor	Very poor	Poor	Poor	Poor	Very poor	Very poor	Very poor	Poor.
16*:									
Roswell	Very poor	Very poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair.
Berwolf	Poor	Fair	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair.
17--- Berwolf	Poor	Fair	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair.
21*:									
Holloman	Very poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor.
Rock outcrop.									
24*:									
Tucumcari	Poor	Fair	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair.
Montoya	Poor	Poor	Poor	Poor	Good	Good	Poor	Good	Poor.
25*:									
Chispa	Poor	Poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair.
Gallen	Very poor	Very poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair.
26*:									
Holloman	Very poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor.
Reeves	Very poor	Very poor	Fair	Poor	Very poor	Very poor	Poor	Very poor	Poor.
27*:									
Los Tanos	Poor	Fair	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair.
Latom	Very poor	Very poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair.
30. Ustifluvents									
31*:									
Chispa	Poor	Poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair.
Redona	Poor	Fair	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair.
32--- Friona	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Very poor	Fair.
34*:									
Gallen	Very poor	Very poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair.
Torriorthents.									

See footnote at end of table.

TABLE 6.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements						Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
35*:									
Tucumcari	Poor	Fair	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair.
Redona	Poor	Fair	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair.
36*:									
Rock outcrop.									
Regnier	Very poor	Very poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair.
Latom	Very poor	Very poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair.
37*:									
Ima	Poor	Fair	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair.
Gallen	Very poor	Very poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair.
39*:									
Sharvana	Poor	Poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair.
Slaughter	Poor	Poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair.
40*:									
Pastura	Very poor	Very poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair.
Darvey	Poor	Poor	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair.
41*:									
Clovis	Poor	Poor	Fair	Poor	Poor	Very poor	Poor	Very poor	Fair.
Pastura	Very poor	Very poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair.
48*:									
Berwolf	Poor	Fair	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair.
Sharvana	Poor	Poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair.
49-----	Poor	Fair	Fair	Fair	Very poor	Very poor	Fair	Very poor	Fair.
Pojo									
50*:									
Berwolf	Poor	Fair	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair.
Chispa	Poor	Poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair.
Armesa	Poor	Fair	Fair	Fair	Very poor	Very poor	Fair	Very poor	Fair.
51*:									
Regnier	Very poor	Very poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair.
Latom	Very poor	Very poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair.
Rock outcrop.									
52*:									
Latom	Very poor	Very poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair.
Berwolf	Poor	Fair	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair.
53-----	Very poor	Very poor	Poor	Poor	Poor	Very poor	Very poor	Very poor	Poor.
Cardenas									
55-----	Poor	Poor	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair.
Darvey									

See footnote at end of table.

TABLE 6.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements						Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
56*:									
Tucumcari	Poor	Fair	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair.
Hassell	Poor	Fair	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair.
57*:									
Latom	Very poor	Very poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair.
Rock outcrop.									
58*:									
Redona	Poor	Fair	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair.
Armesa	Poor	Fair	Fair	Fair	Very poor	Very poor	Fair	Very poor	Fair.
59*:									
Chispa	Poor	Poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair.
Los Tanos	Poor	Fair	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair.
60*:									
Chispa	Poor	Poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair.
Armesa	Poor	Fair	Fair	Fair	Very poor	Very poor	Fair	Very poor	Fair.
Redona	Poor	Fair	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair.
61*:									
Berwolf	Poor	Fair	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair.
Roswell	Very poor	Very poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair.
62*:									
Regnier	Very poor	Very poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair.
Latom	Very poor	Very poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair.
Rock outcrop.									
63*:									
Neso	Very poor	Very poor	Poor	Poor	Poor	Very poor	Very poor	Very poor	Poor.
Kolar	Very poor	Very poor	Poor	Poor	Poor	Very poor	Very poor	Very poor	Poor.
64--Berwolf	Poor	Fair	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair.
66*:									
Pojo	Poor	Fair	Fair	Fair	Very poor	Very poor	Fair	Very poor	Fair.
Kolar	Very poor	Very poor	Poor	Poor	Poor	Very poor	Very poor	Very poor	Poor.
67*:									
Kolar	Very poor	Very poor	Poor	Poor	Poor	Very poor	Very poor	Very poor	Poor.
Neso	Very poor	Very poor	Poor	Poor	Poor	Very poor	Very poor	Very poor	Poor.
Pojo	Poor	Fair	Fair	Fair	Very poor	Very poor	Fair	Very poor	Fair.
68--Poquita	Poor	Poor	Fair	Fair	Poor	Very poor	Poor	Very poor	Fair.

See footnote at end of table.

TABLE 6.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements						Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
69*:									
Deama	Very poor	Very poor	Fair	Poor	Very poor	Very poor	Poor	Very poor	Poor.
Darvey	Poor	Poor	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair.
71, San Jon	Poor	Fair	Poor	Poor	Poor	Very poor	Fair	Very poor	Poor.
72*:									
Lozier	Very poor	Very poor	Poor	Poor	Very poor	Very poor	Poor	Very poor	Poor.
Rock outcrop.									
73*:									
Reeves	Very poor	Very poor	Fair	Poor	Very poor	Very poor	Poor	Very poor	Poor.
Holloman	Very poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor.
102, Redona	Good	Good	Good	Good	Good	Poor	Good	Fair	Good.
103, Chispa	Poor	Poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair.
105, Montoya	Poor	Poor	Poor	Poor	Good	Good	Poor	Good	Poor.
106, La Lande	Good	Good	Good	Good	Good	Good	Good	Good	Good.
107, Ima	Fair	Good	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair.
108, 109, Armesa	Poor	Fair	Fair	Fair	Very poor	Very poor	Fair	Very poor	Fair.
110, Minneosa	Fair	Good	Fair	Fair	Good	Good	Fair	Good	Fair.
111, La Lande	Good	Good	Fair	Fair	Good	Good	Good	Good	Fair.
112, La Lande	Good	Good	Good	Good	Good	Good	Good	Good	Good.
113, 114, Montoya Variant	Poor	Good	Fair	Fair	Good	Good	Fair	Good	Fair.
115, Minneosa	Fair	Good	Fair	Fair	Good	Good	Fair	Good	Fair.
116, Chispa	Poor	Poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair.
117, 118, Berwolf	Fair	Good	Fair	Fair	Good	Good	Fair	Good	Fair.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
12*:						
Ima	Slight	Slight	Slight	Slight	Slight	Slight.
Armesa	Slight	Slight	Slight	Moderate: slope.	Slight	Slight.
14*:						
Kolar	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: thin layer.
Chispa	Slight	Slight	Slight	Slight	Severe: low strength.	Slight.
Neso	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: thin layer.
16*:						
Roswell	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
Berwolf	Slight	Slight	Slight	Moderate: slope.	Slight	Slight.
17--- Berwolf	Slight	Slight	Slight	Slight	Slight	Slight.
21*:						
Holloman	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: excess salt, slope, thin layer.
Rock outcrop.						
24*:						
Tucumcari	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
Montoya	Severe: cutbanks cave.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, shrink-swell.	Moderate: excess salt.
25*:						
Chispa	Slight	Slight	Slight	Slight	Severe: low strength.	Slight.
Gallen	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: small stones, large stones.
26*:						
Holloman	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope.	Severe: excess salt, thin layer.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
26*: Reeves	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength, shrink-swell.	Moderate: excess salt.
27*: Los Tanos	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.	Moderate: thin layer.
Latom	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: thin layer.
30. Ustifluvents						
31*: Chispa	Slight	Slight	Slight	Slight	Severe: low strength.	Slight.
Redona	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Slight.
32 Friona	Moderate: cemented pan.	Slight	Moderate: cemented pan.	Slight	Severe: low strength.	Moderate: thin layer.
34*: Gallen	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
Torriorthents.						
35*: Tucumcari	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
Redona	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Slight.
36*: Rock outcrop.						
Regnier	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, thin layer.
Latom	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
37*: Ima	Slight	Slight	Slight	Slight	Slight	Slight.
Gallen	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: small stones, large stones.
39*: Sharvana	Severe: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.	Moderate: cemented pan.	Severe: thin layer.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
39*: Slaughter	Severe: cemented pan.	Moderate: shrink-swell, cemented pan.	Severe: cemented pan.	Moderate: shrink-swell, cemented pan.	Severe: low strength.	Severe: thin layer.
40*: Pastura	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: thin layer.
Darvey	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.	Slight.
41*: Clovis	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Slight.
Pastura	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: thin layer.
48*: Berwolf	Slight	Slight	Slight	Slight	Slight	Slight.
Sharvana	Severe: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.	Moderate: cemented pan.	Severe: thin layer.
49--- Pojo	Severe: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.	Moderate: cemented pan.	Moderate: thin layer.
50*: Berwolf	Slight	Slight	Slight	Slight	Slight	Slight.
Chispa	Slight	Slight	Slight	Slight	Severe: low strength.	Slight.
Armesa	Slight	Slight	Slight	Slight	Slight	Slight.
51*: Regnier	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope, shrink-swell.	Severe: thin layer.
Latom	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: thin layer.
Rock outcrop.						
52*: Latom	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: thin layer.
Berwolf	Slight	Slight	Slight	Slight	Slight	Slight.
53--- Cardenas	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: slope, cemented pan.	Severe: cemented pan.	Severe: thin layer.
55--- Darvey	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.	Slight.
56*: Tucumcari	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
56*:						
Hassell	Moderate: depth to rock, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Moderate: thin layer.
57*:						
Latom	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: thin layer.
Rock outcrop.						
58*:						
Redona	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Slight.
Armesa	Slight	Slight	Slight	Slight	Slight	Slight.
59*:						
Chispa	Slight	Slight	Slight	Slight	Severe: low strength.	Slight.
Los Tanos	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.	Moderate: thin layer.
60*:						
Chispa	Slight	Slight	Slight	Slight	Severe: low strength.	Slight.
Armesa	Slight	Slight	Slight	Moderate: slope.	Slight	Slight.
Redona	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Slight.
61*:						
Berwolf	Slight	Slight	Slight	Slight	Slight	Slight.
Roswell	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
62*:						
Regnier	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, thin layer.
Latom	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
Rock outcrop.						
63*:						
Neso	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: small stones, thin layer.
Kolar	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: thin layer.
64 Berwolf	Slight	Slight	Slight	Slight	Slight	Slight.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
66*:						
Pojo	Severe: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.	Moderate: cemented pan.	Moderate: thin layer.
Kolar	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: thin layer.
67*:						
Kolar	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: thin layer.
Neso	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: small stones, thin layer.
Pojo	Severe: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.	Moderate: cemented pan.	Moderate: thin layer.
68 Poquita	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.	Slight.
69*:						
Deama	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: thin layer.
Darvey	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.	Slight.
71 San Jon	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: thin layer.
72*:						
Lozier	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: small stones, thin layer.
Rock outcrop.						
73*:						
Reeves	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: excess salt.
Holloman	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.	Severe: excess salt, thin layer.
102 Redona	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Slight.
103 Chispa	Slight	Slight	Slight	Slight	Severe: low strength.	Slight.
105 Montoya	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Moderate: excess salt.
106 La Lande	Slight	Slight	Slight	Slight	Moderate: frost action.	Slight.
107 Ima	Slight	Slight	Slight	Slight	Slight	Slight.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
108---------- Armesa	Slight---------	Slight---------	Slight---------	Slight---------	Slight---------	Slight.
109---------- Armesa	Slight---------	Slight---------	Slight---------	Moderate: slope.	Slight---------	Slight.
110---------- Minneosa	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
111---------- La Lande	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Slight.
112---------- La Lande	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Slight.
113, 114---------- Montoya Variant	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
115---------- Minneosa	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Slight.
116---------- Chispa	Slight---------	Slight---------	Slight---------	Slight---------	Severe: low strength.	Slight.
117, 118---------- Berwolf	Slight---------	Slight---------	Slight---------	Slight---------	Slight---------	Slight.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
12*:					
Ima	Slight	Severe: seepage.	Slight	Slight	Good.
Armesa	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Fair: small stones.
14*:					
Kolar	Severe: cemented pan.	Severe: seepage, cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Poor: area reclaim.
Chispa	Slight	Moderate: seepage, slope.	Slight	Slight	Good.
Neso	Severe: cemented pan.	Severe: cemented pan. seepage.	Severe: cemented pan.	Severe: cemented pan.	Poor: area reclaim, small stones.
16*:					
Roswell	Severe: poor filter.	Severe: seepage, slope.	Severe: too sandy.	Moderate: slope.	Poor: too sandy.
Berwolf	Slight	Severe: seepage.	Moderate: seepage, too sandy.	Moderate: seepage, too sandy.	Good.
17--- Berwolf	Slight	Severe: seepage.	Moderate: too sandy.	Moderate: too sandy.	Good.
21*:					
Holloman	Severe: depth to rock, slope, excess gypsum.	Severe: depth to rock, slope, excess gypsum.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Rock outcrop.					
24*:					
Tucumcari	Severe: percs slowly.	Slight	Slight	Slight	Poor: hard to pack.
Montoya	Severe: percs slowly.	Severe: flooding.	Severe: too clayey.	Moderate: flooding.	Poor: too clayey, hard to pack.
25*:					
Chispa	Slight	Moderate: seepage, slope.	Slight	Slight	Good.
Gallen	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Slight	Poor: seepage, too sandy, small stones.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
26*:					
Holloman	Severe: depth to rock, excess gypsum.	Severe: depth to rock, slope, excess gypsum.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
Reeves	Severe: excess gypsum.	Severe: excess gypsum.	Slight	Slight	Poor: thin layer.
27*:					
Los Tanos	Severe: depth to rock.	Severe: seepage, depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
Latom	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
30. Ustifluvents					
31*:					
Chispa	Slight	Moderate: seepage.	Slight	Slight	Good.
Redona	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Good.
32 Friona	Severe: cemented pan.	Severe: cemented pan.	Moderate: cemented pan, too clayey.	Severe: cemented pan.	Poor: area reclaim.
34*:					
Gallen	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: slope, too sandy.	Severe: slope.	Poor: seepage, too sandy, small stones.
Torriorthents.					
35*:					
Tucumcari	Severe: percs slowly.	Slight	Slight	Slight	Poor: hard to pack.
Redona	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Good.
36*: Rock outcrop.					
Regnier	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Latom	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
37*:					
Ima	Slight	Severe: seepage.	Slight	Slight	Good.
Gallen	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Slight	Poor: seepage, too sandy, small stones.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
39*:					
Sharvana	Severe: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Poor: area reclaim.
Slaughter	Severe: cemented pan.	Severe: cemented pan.	Severe: too clayey.	Severe: cemented pan.	Poor: area reclaim, too clayey.
40*:					
Pastura	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Poor: area reclaim.
Darvey	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
41*:					
Clovis	Moderate: percs slowly.	Severe: seepage.	Slight	Slight	Good.
Pastura	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Poor: area reclaim.
48*:					
Berwolf	Slight	Severe: seepage.	Moderate: too sandy.	Moderate: too sandy.	Good.
Sharvana	Severe: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Poor: area reclaim.
49 Pojo	Severe: cemented pan.	Severe: seepage, cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Poor: area reclaim.
50*:					
Berwolf	Slight	Severe: seepage.	Moderate: too sandy.	Moderate: too sandy.	Good.
Chispa	Slight	Moderate: seepage, slope.	Slight	Slight	Good.
Armesa	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Fair: small stones.
51*:					
Regnier	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
Latom	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
Rock outcrop.					
52*:					
Latom	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
Berwolf	Slight	Severe: seepage.	Moderate: too sandy.	Moderate: too sandy.	Good.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
53--Cardenas	Severe: cemented pan.	Severe: seepage, cemented pan, slope.	Severe: cemented pan.	Severe: cemented pan.	Poor: area reclaim.
55--Darvey	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
56*:					
Tucumcari	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Poor: hard to pack.
Hassell	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, hard to pack.
57*:					
Latom	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
Rock outcrop.					
58*:					
Redona	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
Armesa	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Fair: small stones.
59*:					
Chispa	Slight	Moderate: seepage, slope.	Slight	Slight	Good.
Los Tanos	Severe: depth to rock.	Severe: seepage, depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
60*:					
Chispa	Slight	Moderate: seepage, slope.	Slight	Slight	Good.
Armesa	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Fair: small stones.
Redona	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
61*:					
Berwolf	Slight	Severe: seepage.	Moderate: too sandy.	Moderate: too sandy.	Good.
Roswell	Severe: poor filter.	Severe: seepage, slope.	Severe: too sandy.	Moderate: slope.	Poor: too sandy.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
62*:					
Regnier	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Latom	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Rock outcrop.					
63*:					
Neso	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Poor: area reclaim, small stones.
Kolar	Severe: cemented pan.	Severe: seepage, cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Poor: area reclaim.
64--- Berwolf	Slight	Severe: seepage.	Moderate: too sandy.	Moderate: too sandy.	Good.
66*:					
Pojo	Severe: cemented pan.	Severe: seepage, cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Poor: area reclaim.
Kolar	Severe: cemented pan.	Severe: seepage, cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Poor: area reclaim.
67*:					
Kolar	Severe: cemented pan.	Severe: seepage, cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Poor: area reclaim.
Neso	Severe: cemented pan.	Severe: cemented pan, seepage.	Severe: cemented pan.	Severe: cemented pan.	Poor: area reclaim, small stones.
Pojo	Severe: cemented pan.	Severe: seepage, cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Poor: area reclaim.
68--- Poquita	Moderate: percs slowly.	Severe: seepage.	Slight	Slight	Good.
69*:					
Deama	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, small stones.
Darvey	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
71--- San Jon	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
72*:					
Lozier	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
72*: Rock outcrop.					
73*: Reeves	Severe: excess gypsum.	Severe: excess gypsum.	Slight	Slight	Poor: thin layer.
Holloman	Severe: depth to rock, excess gypsum.	Severe: depth to rock, excess gypsum.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
102 Redona	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Good.
103 Chispa	Slight	Moderate: seepage.	Slight	Slight	Good.
105 Montoya	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
106 La Lande	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Good.
107 Ima	Slight	Severe: seepage.	Slight	Slight	Good.
108, 109 Armesa	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Fair: small stones.
110 Minneosa	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Slight	Poor: seepage, too sandy.
111 La Lande	Moderate: percs slowly.	Severe: seepage.	Slight	Slight	Fair: thin layer.
112 La Lande	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Good.
113, 114 Montoya Variant	Severe: percs slowly.	Severe: seepage.	Severe: too clayey.	Severe: seepage.	Poor: too clayey, hard to pack.
115 Minneosa	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Slight	Poor: seepage, too sandy.
116 Chispa	Slight	Moderate: seepage.	Slight	Slight	Good.
117, 118 Berwolf	Slight	Severe: seepage.	Moderate: too sandy.	Moderate: too sandy.	Good.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
12*:				
Ima	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Armesa	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
14*:				
Kolar	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
Chispa	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
Neso	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
16*:				
Roswell	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
Berwolf	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
17--- Berwolf	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
21*:				
Holloman	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, excess salt, slope.
Rock outcrop.				
24*:				
Tucumcari	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Montoya	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, excess salt.
25*:				
Chispa	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
Gallen	Good	Probable	Probable	Poor: small stones, area reclaim.
26*:				
Holloman	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, excess fines.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
26*: Reeves	Fair: low strength, thin layer, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: excess salt, thin layer.
27*: Los Tanos	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer.
Latom	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
30. Ustifluvents				
31*: Chispa	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
Redona	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Good.
32---- Friona	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, too clayey, thin layer.
34*: Gallen	Fair: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
Torriorthents.				
35*: Tucumcari	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Redona	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Good.
36*: Rock outcrop.				
Regnier	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Latom	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
37*: Ima	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Gallen	Good	Probable	Probable	Poor: small stones, area reclaim.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
39*:				
Sharvana	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
Slaughter	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
40*:				
Pastura	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
Darvey	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Good.
41*:				
Clovis	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Pastura	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
48*:				
Berwolf	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Sharvana	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
49 Pojo	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, too sandy, small stones.
50*:				
Berwolf	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
Chispa	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
Armesa	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
51*:				
Regnier	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
Latom	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
Rock outcrop.				
52*:				
Latom	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
Berwolf	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
53---------- Cardenas	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
55---------- Darvey	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Good.
56*:				
Tucumcari----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Hassell----------	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
57*:				
Latom----------	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
Rock outcrop.				
58*:				
Redona----------	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Good.
Armesa----------	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
59*:				
Chispa----------	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
Los Tanos----------	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer.
60*:				
Chispa----------	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
Armesa----------	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
Redona----------	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Good.
61*:				
Berwolf----------	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
Roswell----------	Good----------	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
62*:				
Regnier----------	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
62*:				
Latom	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Rock outcrop.				
63*:				
Neso	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
Kolar	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
64--- Berwolf	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
66*:				
Pojo	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, too sandy, small stones.
Kolar	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
67*:				
Kolar	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
Neso	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
Pojo	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones.
68--- Poquita	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
69*:				
Deama	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
Darvey	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Good.
71--- San Jon	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
72*:				
Lozier	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
Rock outcrop.				

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
73*: Reeves	Fair: low strength, thin layer, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: excess salt, thin layer.
Holloman	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, excess salt.
102 Redona	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Good.
103 Chispa	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
105 Montoya	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, excess salt.
106 La Lande	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
107 Ima	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
108, 109 Armesa	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones, area reclaim.
110 Minneosa	Good	Probable	Improbable: too sandy.	Fair: thin layer.
111 La Lande	Good	Improbable: small stones.	Probable	Poor: area reclaim.
112 La Lande	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
113, 114 Montoya Variant	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
115 Minneosa	Good	Probable	Improbable: too sandy.	Fair: too clayey, thin layer.
116 Chispa	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, area reclaim.
117 Berwolf	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
118 Berwolf	Good	Improbable: excess fines.	Improbable: excess fines.	Good.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
12*:						
Ima	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing, slope.	Soil blowing	Favorable.
Armesa	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope	Soil blowing	Erodes easily.
14*:						
Kolar	Severe: cemented pan.	Severe: piping.	Deep to water	Soil blowing, cemented pan.	Cemented pan, erodes easily, soil blowing.	Erodes easily, cemented pan.
Chispa	Moderate: seepage.	Moderate: thin layer, piping.	Deep to water	Soil blowing	Soil blowing	Favorable.
Neso	Severe: cemented pan.	Severe: seepage.	Deep to water	Large stones, droughty, cemented pan.	Large stones, cemented pan.	Large stones, droughty, cemented pan.
16*:						
Roswell	Severe: seepage, slope.	Severe: piping.	Deep to water	Droughty, fast intake, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty.
Berwolf	Severe: seepage.	Severe: piping.	Deep to water	Fast intake, soil blowing, slope.	Soil blowing	Favorable.
17--- Berwolf	Severe: seepage.	Severe: piping.	Deep to water	Fast intake, soil blowing.	Soil blowing	Favorable.
21*:						
Holloman	Severe: depth to rock, slope, excess gypsum.	Severe: thin layer, excess gypsum.	Deep to water	Depth to rock, slope, excess gypsum.	Slope, depth to rock, erodes easily.	Slope, excess salt, erodes easily.
Rock outcrop.						
24*:						
Tucumcari	Slight	Moderate: hard to pack.	Deep to water	Favorable	Favorable	Favorable.
Montoya	Slight	Moderate: hard to pack.	Deep to water	Percs slowly	Percs slowly	Excess salt, percs slowly.
25*:						
Chispa	Moderate: seepage, slope.	Moderate: thin layer, piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Gallen	Severe: seepage.	Severe: seepage.	Deep to water	Slope	Large stones, too sandy.	Large stones.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
26*:						
Holloman	Severe: depth to rock, slope, excess gypsum.	Severe: thin layer, excess gypsum.	Deep to water	Depth to rock, slope, excess gypsum.	Slope, depth to rock, erodes easily.	Slope, excess salt, erodes easily.
Reeves	Severe: seepage, excess gypsum.	Severe: piping, excess gypsum.	Deep to water	Slope, excess salt, excess gypsum.	Erodes easily, excess gypsum.	Excess salt, erodes easily.
27*:						
Los Tanos	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing, depth to rock.	Depth to rock	Depth to rock.
Latom	Severe: depth to rock.	Severe: thin layer.	Deep to water	Soil blowing, depth to rock.	Depth to rock, soil blowing.	Depth to rock.
30. Ustifluvents						
31*:						
Chispa	Moderate: seepage.	Moderate: thin layer, piping.	Deep to water	Soil blowing---	Soil blowing---	Favorable.
Redona	Moderate: seepage.	Severe: piping.	Deep to water	Soil blowing---	Soil blowing---	Favorable.
32---------- Friona	Moderate: seepage, cemented pan.	Severe: thin layer.	Deep to water	Cemented pan---	Cemented pan---	Cemented pan.
34*:						
Gallen	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope----------	Slope, large stones, too sandy.	Large stones, slope.
Torriorthents.						
35*:						
Tucumcari	Slight---------	Moderate: hard to pack.	Deep to water	Favorable------	Favorable------	Favorable.
Redona	Moderate: seepage.	Severe: piping.	Deep to water	Favorable------	Favorable------	Favorable.
36*: Rock outcrop.						
Regnier	Severe: depth to rock, slope.	Severe: piping.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
Latom	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Soil blowing, depth to rock, slope.	Slope, depth to rock, soil blowing.	Slope, depth to rock.
37*:						
Ima	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing, slope.	Soil blowing---	Favorable.
Gallen	Severe: seepage.	Severe: seepage.	Deep to water	Slope----------	Large stones, too sandy.	Large stones.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
39*:						
Sharvana	Severe: cemented pan.	Severe: thin layer, piping.	Deep to water	Soil blowing, cemented pan.	Cemented pan, soil blowing.	Cemented pan.
Slaughter	Severe: cemented pan.	Severe: thin layer.	Deep to water	Cemented pan	Cemented pan	Cemented pan.
40*:						
Pastura	Severe: cemented pan.	Severe: thin layer.	Deep to water	Cemented pan, slope.	Cemented pan, erodes easily.	Erodes easily, cemented pan.
Darvey	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
41*:						
Clovis	Severe: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
Pastura	Severe: cemented pan.	Severe: thin layer.	Deep to water	Cemented pan	Cemented pan, erodes easily.	Erodes easily, cemented pan.
48*:						
Berwolf	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing	Soil blowing	Favorable.
Sharvana	Severe: cemented pan.	Severe: thin layer, piping.	Deep to water	Soil blowing, cemented pan.	Cemented pan, soil blowing.	Cemented pan.
49 Pojo	Severe: seepage.	Severe: piping.	Deep to water	Fast intake, soil blowing, cemented pan.	Cemented pan, soil blowing.	Cemented pan.
50*:						
Berwolf	Severe: seepage.	Severe: piping.	Deep to water	Fast intake, soil blowing.	Soil blowing	Favorable.
Chispa	Moderate: seepage.	Moderate: thin layer, piping.	Deep to water	Soil blowing	Soil blowing	Favorable.
Armesa	Moderate: seepage.	Severe: piping.	Deep to water	Soil blowing	Erodes easily, soil blowing.	Erodes easily.
51*:						
Regnier	Severe: depth to rock, slope.	Severe: piping.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
Latom	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Soil blowing, depth to rock, slope.	Slope, depth to rock, soil blowing.	Slope, depth to rock.
Rock outcrop.						
52*:						
Latom	Severe: depth to rock.	Severe: thin layer.	Deep to water	Fast intake, soil blowing, depth to rock.	Depth to rock, soil blowing.	Depth to rock.
Berwolf	Severe: seepage.	Severe: piping.	Deep to water	Fast intake, soil blowing.	Soil blowing	Favorable.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
53---------- Cardenas	Severe: cemented pan, slope.	Severe: piping.	Deep to water	Fast intake, soil blowing, cemented pan.	Slope, cemented pan, soil blowing.	Slope, cemented pan.
55---------- Darvey	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
56*: Tucumcari---------	Slight---------	Moderate: hard to pack.	Deep to water	Favorable------	Favorable------	Favorable.
Hassell----------	Moderate: depth to rock.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly, depth to rock.	Depth to rock, erodes easily, percs slowly.	Erodes easily, depth to rock, percs slowly.
57*: Latom----------	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Soil blowing, depth to rock, slope.	Slope, depth to rock, soil blowing.	Slope, depth to rock.
Rock outcrop.						
58*: Redona----------	Moderate: seepage.	Severe: piping.	Deep to water	Favorable------	Favorable------	Favorable.
Armesa----------	Moderate: seepage.	Severe: piping.	Deep to water	Favorable------	Erodes easily	Erodes easily.
59*: Chispa----------	Moderate: seepage.	Moderate: thin layer, piping.	Deep to water	Soil blowing---	Soil blowing---	Favorable.
Los Tanos---------	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing, depth to rock.	Depth to rock, soil blowing.	Depth to rock.
60*: Chispa----------	Moderate: seepage, slope.	Moderate: thin layer, piping.	Deep to water	Slope, soil blowing.	Soil blowing---	Favorable.
Armesa----------	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope, soil blowing.	Erodes easily, soil blowing.	Erodes easily.
Redona----------	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope, soil blowing.	Soil blowing---	Favorable.
61*: Berwolf----------	Severe: seepage.	Severe: piping.	Deep to water	Fast intake, soil blowing, slope.	Soil blowing---	Favorable.
Roswell----------	Severe: seepage, slope.	Severe: piping.	Deep to water	Droughty, fast intake, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty.
62*: Regnier----------	Severe: depth to rock, slope.	Severe: piping.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
62*:						
Latom	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
Rock outcrop.						
63*:						
Neso	Severe: cemented pan.	Severe: seepage.	Deep to water	Large stones, droughty, cemented pan.	Large stones, cemented pan.	Large stones, droughty, cemented pan.
Kolar	Severe: cemented pan.	Severe: piping.	Deep to water	Soil blowing, cemented pan.	Cemented pan, soil blowing.	Cemented pan.
64--- Berwolf	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing---	Soil blowing---	Favorable.
66*:						
Pojo	Severe: seepage.	Severe: piping.	Deep to water	Fast intake, soil blowing, cemented pan.	Cemented pan, soil blowing.	Cemented pan.
Kolar	Severe: cemented pan.	Severe: piping.	Deep to water	Fast intake, soil blowing, cemented pan.	Cemented pan, soil blowing.	Cemented pan.
67*:						
Kolar	Severe: cemented pan.	Severe: piping.	Deep to water	Soil blowing, cemented pan.	Cemented pan, soil blowing.	Cemented pan.
Neso	Severe: cemented pan.	Severe: seepage.	Deep to water	Large stones, droughty, cemented pan.	Large stones, cemented pan.	Large stones, droughty, cemented pan.
Pojo	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing, cemented pan.	Cemented pan, soil blowing.	Cemented pan.
68--- Poquita	Moderate: seepage.	Severe: piping.	Deep to water	Soil blowing, erodes easily.	Erodes easily, soil blowing.	Erodes easily.
69*:						
Deama	Severe: depth to rock.	Severe: seepage.	Deep to water	Droughty, depth to rock, slope.	Large stones, depth to rock.	Large stones, droughty.
Darvey	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
71--- San Jon	Moderate: depth to rock.	Severe: thin layer.	Deep to water	Depth to rock, erodes easily.	Depth to rock, erodes easily.	Erodes easily, depth to rock.
72*:						
Lozier	Severe: depth to rock.	Severe: thin layer.	Deep to water	Large stones, droughty, depth to rock.	Large stones, depth to rock.	Large stones, droughty, depth to rock.
Rock outcrop.						
73*:						
Reeves	Severe: seepage, excess gypsum.	Severe: piping, excess gypsum.	Deep to water	Excess salt, excess gypsum.	Erodes easily, excess gypsum.	Excess salt, erodes easily.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
73*: Holloman	Severe: depth to rock, excess gypsum.	Severe: thin layer, excess gypsum.	Deep to water	Depth to rock, slope, excess gypsum.	Depth to rock, erodes easily, excess gypsum.	Excess salt, erodes easily.
102 Redona	Moderate: seepage.	Severe: piping.	Deep to water	Soil blowing	Soil blowing	Favorable.
103 Chispa	Moderate: seepage.	Moderate: thin layer, piping.	Deep to water	Soil blowing	Soil blowing	Favorable.
105 Montoya	Slight	Moderate: hard to pack.	Deep to water	Percs slowly	Percs slowly	Excess salt, percs slowly.
106 La Lande	Moderate: seepage.	Severe: piping.	Deep to water	Soil blowing	Soil blowing	Favorable.
107 Ima	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing	Soil blowing	Favorable.
108 Armesa	Moderate: seepage.	Severe: piping.	Deep to water	Fast intake	Soil blowing	Favorable.
109 Armesa	Moderate: seepage, slope.	Severe: piping.	Deep to water	Fast intake, slope.	Soil blowing	Favorable.
110 Minneosa	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
111 La Lande	Moderate: seepage.	Moderate: thin layer.	Deep to water	Favorable	Favorable	Favorable.
112 La Lande	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Erodes easily	Erodes easily.
113 Montoya Variant	Slight	Moderate: hard to pack.	Deep to water	Percs slowly	Percs slowly	Percs slowly.
114 Montoya Variant	Slight	Moderate: hard to pack.	Deep to water	Soil blowing, percs slowly.	Soil blowing, percs slowly.	Percs slowly.
115 Minneosa	Severe: seepage.	Severe: seepage, piping.	Deep to water	Favorable	Too sandy	Favorable.
116 Chispa	Moderate: seepage.	Moderate: thin layer, piping.	Deep to water	Favorable	Favorable	Favorable.
117 Berwolf	Severe: seepage.	Severe: piping.	Deep to water	Fast intake, soil blowing.	Soil blowing	Favorable.
118 Berwolf	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing	Soil blowing	Favorable.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
12*:											
Ima	0-7	Fine sandy loam	SM	A-2, A-4	0	90-100	85-100	75-100	25-50	20-30	NP-5
	7-60	Fine sandy loam, sandy loam.	SM	A-2, A-4	0	90-100	85-100	75-100	25-50	20-30	NP-5
Armesa	0-3	Fine sandy loam	SM	A-2, A-4	0	100	95-100	60-75	30-40	20-25	NP-5
	3-60	Sandy clay loam, loam, very fine sandy loam.	SM-SC, CL-ML	A-4	0	100	95-100	70-85	40-60	25-30	5-10
14*:											
Kolar	0-11	Very fine sandy loam.	SM, ML	A-4	0	95-100	95-100	75-85	45-55	20-25	NP-5
	11-18	Gravelly very fine sandy loam, very fine sandy loam.	SM, ML	A-4	0-10	70-90	65-85	50-65	40-55	20-25	NP-5
	18	Indurated	---	---	---	---	---	---	---	---	---
Chispa	0-8	Fine sandy loam	SM, ML	A-4	0	90-100	85-100	75-90	35-60	20-25	NP-5
	8-35	Sandy clay loam, clay loam, loam.	CL	A-6, A-7	0	90-100	85-100	75-90	50-70	30-45	10-25
	35-60	Sandy loam, sandy clay loam, loam.	SC, CL, SM-SC, CL-ML	A-4, A-6	0-5	85-100	80-100	50-90	35-60	20-35	5-15
Neso	0-5	Gravelly fine sandy loam.	SM	A-2, A-4	10-15	65-90	60-85	55-70	30-40	20-25	NP-5
	5-14	Very cobbly fine sandy loam, very gravelly fine sandy loam, extremely cobbly fine sandy loam.	GM	A-1, A-2	15-50	35-65	35-60	25-40	10-30	20-25	NP-5
	14	Indurated	---	---	---	---	---	---	---	---	---
16*:											
Roswell	0-13	Fine sand	SM	A-2	0	100	95-100	75-85	15-25	---	NP
	13-60	Fine sand, loamy fine sand.	SM	A-2	0	100	95-100	65-80	20-35	---	NP
Berwolf	0-16	Loamy fine sand	SM	A-2	0	100	100	75-90	20-30	---	NP
	16-35	Fine sandy loam, sandy loam.	SM	A-2	0	100	100	65-80	25-35	20-25	NP-5
	35-60	Fine sandy loam, loamy fine sand.	SM	A-2, A-4	0	100	100	75-90	20-40	20-25	NP-5
17	0-11	Loamy fine sand	SM	A-2	0	100	100	75-90	20-30	---	NP
Berwolf	11-36	Fine sandy loam, sandy loam.	SM	A-2	0	100	100	65-80	25-35	20-25	NP-5
	36-60	Fine sandy loam, loamy fine sand.	SM	A-2, A-4	0	100	100	75-90	20-40	20-25	NP-5
21*:											
Holloman	0-13	Loam	CL-ML	A-4	0	100	95-100	70-85	55-70	25-30	5-10
	13	Weathered bedrock	---	---	---	---	---	---	---	---	---
Rock outcrop.											

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
24*:											
Tucumcari-------	0-5	Clay loam--------	CL	A-6	0	100	100	85-95	65-75	25-35	10-15
	5-60	Clay loam, clay, silty clay loam.	CL, CH	A-6, A-7	0	100	100	90-100	60-90	35-55	20-35
Montoya---------	0-3	Clay loam--------	CL	A-6, A-7	0	100	100	90-100	70-85	30-50	10-25
	3-60	Clay loam, clay, silty clay loam.	CL, CH	A-7, A-6	0	95-100	95-100	90-100	75-95	35-55	20-35
25*:											
Chispa----------	0-10	Loam-------------	ML	A-4	0	90-100	85-100	75-90	50-70	20-25	5-10
	10-38	Sandy clay loam, clay loam, loam.	CL	A-6, A-7	0	90-100	85-100	75-90	50-70	30-45	10-25
	38-60	Sandy loam, sandy clay loam, loam.	SC, CL, SM-SC, CL-ML	A-4, A-6	0-5	85-100	80-100	50-90	35-60	20-35	5-15
Gallen----------	0-6	Gravelly loam----	GM, SM	A-4	0-10	65-85	55-75	50-65	40-50	20-25	NP-5
	6-21	Extremely gravelly loam, very gravelly loam, very gravelly sandy loam.	GP, GP-GM, GM	A-1, A-2	10-25	20-60	5-50	5-40	0-30	20-25	NP-5
	21-33	Stratified very gravelly loam to extremely gravelly loamy sand.	GP, SP, GP-GM, SM	A-1	10-25	20-60	5-50	5-35	0-20	15-20	NP-5
	33-60	Very gravelly sand, very gravelly loamy sand, extremely gravelly sand.	GP, SP, GP-GM, SM	A-1	10-25	20-60	5-50	5-25	0-15	---	NP
26*:											
Holloman--------	0-14	Silt loam--------	CL-ML	A-4	0	100	95-100	75-90	60-75	25-30	5-10
	14	Weathered bedrock	---	---	---	---	---	---	---	---	---
Reeves----------	0-15	Loam-------------	CL-ML, CL	A-4, A-6	0	100	100	75-90	60-80	25-35	5-15
	15-35	Loam, clay loam	CL-ML, CL	A-4, A-6	0	100	100	75-90	65-80	25-35	5-15
	35	Gypsiferous material.	---	---	---	---	---	---	---	---	---
27*:											
Los Tanos-------	0-5	Fine sandy loam	SM	A-4, A-2	0	100	95-100	70-80	30-50	20-35	NP-5
	5-21	Sandy loam, loam, fine sandy loam.	ML, SM	A-4, A-2	0	100	95-100	60-85	30-55	20-35	NP-10
	21	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Latom-----------	0-8	Fine sandy loam	SM	A-4, A-2	0-5	90-100	90-100	70-90	25-45	20-25	NP-5
	8	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
30. Ustifluvents											
31*:											
Chispa----------	0-7	Fine sandy loam	SM, ML	A-4, A-6	0	90-100	85-100	75-90	35-60	20-25	NP-5
	7-43	Sandy clay loam, clay loam, loam.	CL	A-6, A-7	0	90-100	85-100	75-90	50-70	30-45	10-25
	43-60	Sandy loam, sandy clay loam, loam.	SC, CL, SM-SC, CL-ML	A-4, A-6	0-5	85-100	80-100	50-90	35-60	20-35	5-15

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
31*:											
Redona----------	0-8	Fine sandy loam	SM	A-2, A-4	0	100	100	80-90	30-50	15-25	NP-5
	8-60	Sandy clay loam, clay loam.	CL-ML, CL, SM-SC, SC	A-4, A-6	0	100	100	80-100	35-55	25-35	5-15
32----------	0-6	Sandy clay loam	CL	A-6	0	100	100	90-100	50-70	25-35	10-15
Friona	6-26	Sandy clay loam, clay loam, loam.	CL	A-6, A-7	0	100	100	90-100	60-75	30-45	10-25
	26	Cemented---------	---	---	---	---	---	---	---	---	---
34*:											
Gallen----------	0-8	Very gravelly sandy loam.	GM	A-1, A-2	0-10	40-60	30-50	20-40	15-30	20-25	NP-5
	8-40	Extremely gravelly loam, very gravelly loam, very gravelly sandy loam.	GP, GP-GM, GM	A-1, A-2	10-25	20-60	5-50	5-40	0-30	20-25	NP-5
	40-60	Very gravelly sand, very gravelly loamy sand, extremely gravelly sandy loam.	GP, SP, GP-GM, SM	A-1	10-25	20-60	5-50	5-25	0-15	---	NP
Torriorthents.											
35*:											
Tucumcari-------	0-7	Sandy clay loam	CL	A-6	0	100	100	75-90	50-70	25-35	10-15
	7-60	Clay loam, clay, silty clay loam.	CL, CH	A-6, A-7	0	100	100	90-100	60-90	35-55	20-35
Redona----------	0-5	Sandy clay loam	CL-ML	A-4	0	100	100	85-100	60-75	20-25	5-10
	5-60	Sandy clay loam, clay loam.	CL-ML, CL, SM-SC, SC	A-4, A-6	0	100	100	80-100	35-55	25-35	5-15
36*:											
Rock outcrop.											
Regnier----------	0-8	Gravelly sandy clay loam.	SC, GC, SM-SC, GM-GC	A-2	0-10	60-80	55-75	50-70	25-35	25-35	5-15
	8-16	Clay loam, sandy clay loam.	CL, CL-ML	A-4, A-6	0	95-100	90-100	70-85	50-65	25-35	5-15
	16	Weathered bedrock	---	---	---	---	---	---	---	---	---
Latom----------	0-8	Sandy loam-------	SM	A-4, A-2	0-5	90-100	90-100	70-90	25-45	20-25	NP-5
	8	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
37*:											
Ima----------	0-12	Fine sandy loam	SM	A-2, A-4	0	90-100	85-100	75-100	25-50	20-30	NP-5
	12-60	Fine sandy loam, sandy loam.	SM	A-2, A-4	0	90-100	85-100	75-100	25-50	20-30	NP-5

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
37*:											
Gallen----------	0-5	Gravelly sandy loam.	SM	A-2	0-10	65-85	55-75	35-50	25-35	20-25	NP-5
	5-20	Extremely gravelly loam, very gravelly loam, very gravelly sandy loam.	GP, GP-GM, GM	A-1, A-2	10-25	20-60	5-50	5-40	0-30	20-25	NP-5
	20-60	Very gravelly sand, very gravelly loamy sand, extremely gravelly sandy loam.	GP, SP, GP-GM, SM	A-1	10-25	20-60	5-50	5-25	0-15	---	NP
39*:											
Sharvana--------	0-13	Fine sandy loam	SM	A-2, A-4	0	100	100	80-100	30-50	20-25	NP-5
	13	Indurated--------	---	---	---	---	---	---	---	---	---
Slaughter-------	0-2	Sandy clay loam	SM-SC, CL-ML, SC CL	A-4, A-6	0	100	100	50-70	40-55	20-35	5-15
	2-17	Clay loam, clay	CL	A-6, A-7	0	95-100	95-100	95-100	65-90	35-50	15-30
	17	Indurated--------	---	---	---	---	---	---	---	---	---
40*:											
Pastura---------	0-4	Loam-------------	CL-ML, CL	A-4, A-6	0-10	90-100	85-100	70-90	50-70	25-35	5-15
	4-10	Loam, clay loam, gravelly clay loam.	CL-ML, CL	A-4, A-6	0	75-95	65-90	60-80	50-70	25-35	5-15
	10	Indurated--------	---	---	---	---	---	---	---	---	---
Darvey----------	0-6	Loam-------------	ML, CL-ML	A-4	0	100	100	85-95	60-75	25-35	5-10
	6-60	Loam, clay loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	85-100	60-85	25-40	5-20
41*:											
Clovis----------	0-3	Loam-------------	CL	A-6	0	100	100	90-100	60-85	25-30	10-15
	3-29	Sandy clay loam, clay loam, loam.	CL	A-6	0	100	100	90-100	50-85	30-40	10-20
	29-60	Very fine sandy loam, fine sandy loam, loam.	ML, CL-ML	A-4	0	100	100	90-100	50-75	20-30	NP-10
Pastura---------	0-3	Loam-------------	CL-ML	A-4	0-10	90-100	85-100	70-90	50-70	25-30	5-10
	3-15	Loam, clay loam, gravelly clay loam.	CL-ML, CL	A-4, A-6	0	75-95	65-90	60-80	50-70	25-35	5-15
	15	Indurated--------	---	---	---	---	---	---	---	---	---
48*:											
Berwolf---------	0-11	Fine sandy loam	SM	A-2, A-4	0	100	100	75-90	30-40	20-25	NP-5
	11-45	Fine sandy loam, sandy loam.	SM	A-2	0	100	100	65-80	25-35	20-25	NP-5
	45-60	Fine sandy loam, loamy fine sand.	SM	A-2, A-4	0	100	100	75-90	20-40	20-25	NP-5
Sharvana--------	0-4	Fine sandy loam	SM	A-2, A-4	0	100	100	80-100	30-50	20-25	NP-5
	4-12	Sandy clay loam	SC, CL, CL-ML, SM-SC	A-4, A-6	0	100	100	70-95	35-60	20-35	5-15
	12	Indurated--------	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
49----------	0-9	Loamy fine sand	SM	A-2	0	95-100	95-100	70-85	25-35	---	NP
Pojo	9-25	Fine sandy loam	SM	A-4	0-5	90-100	90-100	70-80	40-50	20-25	NP-5
	25	Indurated--------	---	---	---	---	---	---	---	---	---
50*:											
Berwolf----------	0-6	Loamy fine sand	SM	A-2	0	100	100	75-90	20-30	---	NP
	6-36	Fine sandy loam, sandy loam.	SM	A-2	0	100	100	65-80	25-35	20-25	NP-5
	36-60	Fine sandy loam, loamy fine sand, sandy loam.	SM	A-2, A-4	0	100	100	75-90	20-40	20-25	NP-5
Chispa----------	0-10	Fine sandy loam	SM, ML	A-4	0	90-100	85-100	75-90	35-60	20-30	NP-5
	10-42	Sandy clay loam, clay loam, loam.	CL	A-6, A-7	0	90-100	85-100	75-90	50-70	30-45	10-25
	42-60	Sandy loam, sandy clay loam, loam.	SC, CL, SM-SC, CL-ML	A-4, A-6	0-5	85-100	80-100	50-90	35-60	20-35	5-15
Armesa----------	0-15	Fine sandy loam	SM	A-2, A-4	0	100	95-100	60-75	30-40	20-25	NP-5
	15-60	Sandy clay loam, loam, very fine sandy loam.	SM-SC, CL-ML	A-4	0	100	95-100	70-85	40-60	25-30	5-10
51*:											
Regnier----------	0-9	Clay loam--------	CL	A-6	0	80-100	75-100	65-80	55-65	30-35	10-15
	9-18	Clay loam, sandy clay loam.	CL, CL-ML	A-4, A-6	0	95-100	90-100	70-85	50-65	25-35	5-15
	18	Weathered bedrock	---	---	---	---	---	---	---	---	---
Latom----------	0-7	Fine sandy loam	SM	A-4, A-2	0-5	90-100	90-100	70-90	25-45	20-25	NP-5
	7	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
52*:											
Latom----------	0-3	Loamy fine sand	SM	A-2	0-5	95-100	90-100	75-90	15-30	---	NP
	3-7	Fine sandy loam	SM	A-4, A-2	0-5	95-100	90-100	75-90	30-45	20-25	NP-5
	7	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Berwolf----------	0-16	Loamy fine sand	SM	A-2	0	100	100	75-90	20-30	---	NP
	16-33	Fine sandy loam, sandy loam.	SM	A-2	0	100	100	65-80	25-35	20-25	NP-5
	33-60	Fine sandy loam, loamy fine sand.	SM	A-2, A-4	0	100	100	75-90	20-40	20-25	NP-5
53----------	0-3	Loamy fine sand	SM	A-2, A-4	0	95-100	95-100	70-90	15-40	---	NP
Cardenas	3-14	Fine sandy loam	SM	A-4	0	95-100	90-100	70-90	40-50	15-20	NP-5
	14	Indurated--------	---	---	---	---	---	---	---	---	---
55----------	0-6	Loam----------	ML, CL-ML	A-4	0	100	100	85-95	60-75	25-35	5-10
Darvey	6-60	Loam, clay loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	85-100	60-85	25-40	5-20
56*:											
Tucumcari--------	0-8	Clay loam--------	CL	A-6	0	100	100	85-95	65-75	25-35	10-15
	8-60	Clay loam, clay, silty clay loam.	CL, CH	A-6, A-7	0	100	100	90-100	60-90	35-55	20-35
Hassell----------	0-5	Clay loam--------	ML, CL	A-6, A-7	0	100	100	85-95	70-90	35-45	10-20
	5-32	Clay loam, silty clay loam, clay.	CL, CH	A-7	0	100	100	90-100	75-95	40-55	15-30
	32	Weathered bedrock	---	---	---	---	---	---	---	---	---

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
57*:											
Latom----------	0-7	Fine sandy loam	SM	A-4, A-2	0-5	90-100	90-100	70-90	25-45	20-25	NP-5
	7	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
58*:											
Redona----------	0-6	Sandy clay loam	CL-ML	A-4	0	100	100	85-100	60-75	20-25	5-10
	6-60	Sandy clay loam, clay loam.	CL-ML, CL, SM-SC, SC	A-4, A-6	0	100	100	80-100	35-55	25-35	5-15
Armesa----------	0-2	Sandy clay loam	SM-SC, CL-ML	A-4	0	100	95-100	70-85	40-60	25-30	5-10
	2-60	Sandy clay loam, loam, very fine sandy loam.	SM-SC, CL-ML	A-4	0	100	95-100	70-85	40-60	25-30	5-10
59*:											
Chispa----------	0-4	Fine sandy loam	SM, ML	A-4	0	90-100	85-100	75-90	35-60	20-30	NP-5
	4-23	Sandy clay loam, clay loam, loam.	CL	A-6, A-7	0	90-100	85-100	75-90	50-70	30-45	10-25
	23-60	Sandy loam, sandy clay loam, loam.	SC, CL, SM-SC, CL-ML	A-4, A-6	0-5	85-100	80-100	50-90	35-60	20-35	5-15
Los Tanos-------	0-8	Fine sandy loam	SM	A-4, A-2	0	100	95-100	70-80	30-50	20-35	NP-5
	8-34	Sandy loam, loam, fine sandy loam.	ML, SM	A-4, A-2	0	100	95-100	65-85	30-55	20-35	NP-10
	34	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
60*:											
Chispa----------	0-7	Fine sandy loam	SM, ML	A-4	0	90-100	85-100	75-90	35-60	20-30	NP-5
	7-32	Sandy clay loam, clay loam, loam.	CL	A-6, A-7	0	90-100	85-100	75-90	50-70	30-45	10-25
	32-60	Sandy loam, sandy clay loam, loam.	SC, CL, SM-SC, CL-ML	A-4, A-6	0-5	85-100	80-100	50-90	35-60	20-35	5-15
Armesa----------	0-10	Fine sandy loam	SM	A-2, A-4	0	100	95-100	70-80	30-40	20-25	NP-5
	10-60	Sandy clay loam, loam, fine sandy loam.	SM-SC, CL-ML	A-4	0	100	95-100	65-85	40-60	25-30	5-10
Redona----------	0-6	Fine sandy loam	SM	A-2, A-4	0	100	100	80-90	30-50	15-25	NP-5
	6-60	Sandy clay loam, clay loam.	CL-ML, CL, SM-SC, SC	A-4, A-6	0	100	100	80-100	35-55	25-35	5-15
61*:											
Berwolf----------	0-11	Loamy fine sand	SM	A-2	0	100	100	75-90	20-30	---	NP
	11-42	Fine sandy loam, sandy loam.	SM	A-2	0	100	100	65-80	25-35	20-25	NP-5
	42-60	Fine sandy loam, loamy fine sand.	SM	A-2, A-4	0	100	100	75-90	20-40	20-25	NP-5
Roswell----------	0-8	Fine sand---------	SM	A-2	0	100	95-100	75-85	15-25	---	NP
	8-60	Fine sand, loamy fine sand.	SM	A-2	0	100	95-100	65-80	20-35	---	NP

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
62*:											
Regnier----------	0-2	Clay loam--------	CL	A-6	0	80-100	75-100	65-80	55-65	30-35	10-15
	2-17	Clay loam, sandy clay loam.	CL, CL-ML	A-4, A-6	0	95-100	90-100	70-85	50-65	25-35	5-15
	17	Weathered bedrock	---	---	---	---	---	---	---	---	---
Latom----------	0-9	Gravelly fine sandy loam.	SM	A-4, A-2	0-15	65-85	60-75	50-65	30-50	20-25	NP-5
	9	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
63*:											
Neso----------	0-6	Very gravelly fine sandy loam.	GM	A-1, A-2	15-30	40-65	35-60	25-40	15-30	20-25	NP-5
	6-12	Very cobbly fine sandy loam, very gravelly fine sandy loam, extremely cobbly fine sandy loam.	GM	A-1, A-2	15-50	35-65	35-60	25-40	10-30	20-25	NP-5
	12	Indurated--------	---	---	---	---	---	---	---	---	---
Kolar----------	0-9	Fine sandy loam	SM	A-4	0	95-100	95-100	70-80	40-50	20-25	NP-5
	9-14	Gravelly very fine sandy loam, sandy loam, fine sandy loam.	SM, ML	A-4	0-10	70-90	65-85	50-65	40-55	20-25	NP-5
	14	Indurated--------	---	---	---	---	---	---	---	---	---
64----------	0-7	Fine sandy loam	SM	A-2, A-4	0	100	100	75-90	30-40	20-25	NP-5
Berwolf	7-39	Fine sandy loam, sandy loam.	SM	A-2	0	100	100	65-80	25-35	20-25	NP-5
	39-60	Fine sandy loam, loamy fine sand.	SM	A-2, A-4	0	100	100	75-90	20-40	20-25	NP-5
66*:											
Pojo----------	0-5	Loamy fine sand	SM	A-2	0	95-100	95-100	70-85	25-35	---	NP
	5-29	Fine sandy loam	SM	A-4	0-5	90-100	90-100	70-80	40-50	20-25	NP-5
	29	Indurated--------	---	---	---	---	---	---	---	---	---
Kolar----------	0-6	Loamy fine sand	SM	A-2	0	95-100	95-100	70-85	25-35	---	NP
	6-15	Gravelly very fine sandy loam, sandy loam, fine sandy loam.	SM, ML	A-4	0-10	70-90	65-85	50-65	40-55	20-25	NP-5
	15	Indurated--------	---	---	---	---	---	---	---	---	---
67*:											
Kolar----------	0-3	Fine sandy loam	SM	A-4	0	95-100	95-100	70-80	40-50	20-25	NP-5
	3-17	Gravelly very fine sandy loam, sandy loam, fine sandy loam.	SM, ML	A-4	0-10	70-90	65-85	50-65	40-55	20-25	NP-5
	17	Indurated--------	---	---	---	---	---	---	---	---	---
Neso----------	0-4	Very gravelly fine sandy loam.	GM	A-1, A-2	15-30	40-65	35-60	25-40	15-30	20-25	NP-5
	4-11	Very cobbly fine sandy loam, very gravelly fine sandy loam, extremely cobbly fine sandy loam.	GM	A-1, A-2	15-50	35-65	35-60	25-40	10-30	20-25	NP-5
	11	Indurated--------	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
67*:											
Pojo	0-5	Fine sandy loam	SM	A-4	0	95-100	95-100	70-80	40-50	20-25	NP-5
	5-32	Fine sandy loam	SM	A-4	0-5	90-100	90-100	70-80	40-50	20-25	NP-5
	32	Indurated	---	---	---	---	---	---	---	---	---
68 Poquita	0-8	Very fine sandy loam.	ML	A-4	0	100	100	85-100	50-65	15-20	NP-5
	8-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0	100	100	95-100	80-90	20-30	5-15
69*:											
Deama	0-7	Gravelly loam	GM	A-4	0-10	60-70	55-70	45-55	35-45	25-40	NP-10
	7-13	Very gravelly loam, extremely cobbly loam, extremely gravelly loam.	GM	A-2, A-1	10-55	20-60	15-55	15-40	10-35	25-40	NP-10
	13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Darvey	0-6	Loam	ML, CL-ML	A-4	0	100	100	85-95	60-75	25-35	5-10
	6-60	Loam, clay loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	85-100	60-85	25-40	5-20
71 San Jon	0-8	Loam	ML, CL-ML	A-4	0	85-100	80-95	75-90	55-70	25-35	5-10
	8-33	Loam, clay loam, silty clay loam.	CL	A-6	0	80-95	75-90	70-85	55-80	30-40	10-15
	33	Weathered bedrock	---	---	---	---	---	---	---	---	---
72*:											
Lozier	0-13	Very gravelly loam.	GM-GC	A-2, A-4,	10-20	30-60	25-55	20-50	15-45	25-30	5-10
	13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
73*:											
Reeves	0-7	Silt loam	CL-ML, CL	A-4, A-6	0	100	100	75-90	60-80	25-35	5-15
	7-28	Loam, clay loam	CL-ML, CL	A-4, A-6	0	100	100	75-90	65-80	25-35	5-15
	28	Gypsiferous material.	---	---	---	---	---	---	---	---	---
Holloman	0-19	Loam	CL-ML	A-4	0	100	95-100	70-85	55-70	25-30	5-10
	19	Weathered bedrock	---	---	---	---	---	---	---	---	---
102 Redona	0-7	Fine sandy loam	SM	A-2, A-4	0	100	100	80-90	30-50	15-25	NP-5
	7-60	Sandy clay loam, clay loam.	CL-ML, CL, SM-SC, SC	A-4, A-6	0	100	100	80-100	35-55	25-35	5-15
103 Chispa	0-11	Fine sandy loam	SM, ML	A-4	0	90-100	85-100	75-90	35-60	20-30	NP-5
	11-46	Sandy clay loam, clay loam, loam.	CL	A-6, A-7	0	90-100	85-100	75-90	50-70	30-45	10-25
	46-60	Sandy loam, sandy clay loam, fine sandy loam.	SC, CL, SM-SC, CL-ML	A-4, A-6	0-5	85-100	80-100	50-90	35-60	20-35	5-15
105 Montoya	0-6	Clay loam	CL	A-6, A-7	0	100	100	90-100	70-85	30-50	10-25
	6-60	Clay, silty clay, clay loam.	CL, CH	A-7, A-6	0	95-100	95-100	90-100	75-95	35-55	20-35
106 La Lande	0-10	Fine sandy loam	SM	A-2, A-4	0	100	100	75-90	30-40	20-25	NP-5
	10-60	Sandy clay loam	CL-ML, CL	A-4, A-6	0	100	100	75-90	55-65	25-35	5-15
107 Ima	0-10	Fine sandy loam	SM	A-2, A-4	0	90-100	85-100	75-100	25-50	20-30	NP-5
	10-60	Fine sandy loam, sandy loam.	SM	A-2, A-4	0	90-100	85-100	75-100	25-50	20-30	NP-5

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
108----------	0-4	Loamy fine sand	SM	A-2	0	100	95-100	70-85	20-30	---	NP
Armesa	4-31	Sandy clay loam, loam, fine sandy loam.	SM-SC, CL-ML	A-4	0	100	95-100	65-85	40-60	25-30	5-10
	31-60	Gravelly silty clay loam, gravelly sandy clay loam, gravelly silt loam.	GM-GC, SM-SC, CL-ML	A-4	0	60-85	50-75	40-70	35-65	25-30	5-10
109----------	0-4	Loamy fine sand	SM	A-2	0	100	95-100	70-85	20-30	---	NP
Armesa	4-60	Sandy clay loam, loam, fine sandy loam.	SM-SC, CL-ML	A-4	0	100	95-100	65-85	40-60	25-30	5-10
110----------	0-8	Fine sandy loam	SM	A-4	0	100	100	70-85	35-50	20-25	NP-5
Minneosa	8-38	Loamy fine sand	SM	A-2	0	100	100	75-90	20-35	---	NP
	38-60	Sand----------	SM, SP-SM	A-2, A-3	0	100	100	50-65	5-15	---	NP
111----------	0-40	Sandy clay loam	SM-SC, SC	A-4, A-6	0	100	100	80-90	35-50	25-35	5-15
La Lande	40-60	Extremely gravelly sandy loam.	GP-GM, GM	A-1	0-10	25-35	15-25	10-20	5-15	20-25	NP-5
112----------	0-10	Sandy clay loam	SM-SC	A-4	0	100	100	75-90	40-50	25-30	5-10
La Lande	10-40	Loam, sandy clay loam, clay loam.	CL-ML, CL	A-4, A-6	0	100	100	75-90	55-65	25-35	5-15
	40-60	Loam, sandy clay loam.	CL-ML	A-4	0	100	100	70-85	50-60	25-30	5-10
113----------	0-10	Sandy clay loam	SM-SC, SC	A-4, A-6	0	100	95-100	70-85	35-50	25-35	5-15
Montoya Variant	10-18	Fine sandy loam	SM	A-4	0	100	95-100	70-85	35-45	20-25	NP-5
	18-60	Clay loam, clay.	CL, CH	A-6, A-7	0	100	100	90-100	75-95	35-55	20-35
114----------	0-18	Fine sandy loam	SM	A-4	0	100	95-100	70-85	35-45	10-25	NP-5
Montoya Variant	18-60	Silty clay loam, clay.	CL, CH	A-6, A-7	0	100	100	90-100	75-95	35-55	20-35
115----------	0-14	Sandy clay loam	SM-SC, SC	A-4, A-6	0	100	100	70-85	35-50	25-35	5-15
Minneosa	14-27	Fine sandy loam	SM	A-4	0	100	100	75-85	35-45	20-25	NP-5
	27-35	Loamy fine sand	SM	A-2	0	100	100	75-90	20-35	---	NP
	35-60	Sand----------	SM, SP-SM	A-2, A-3	0	100	100	50-65	5-15	---	NP
116----------	0-12	Sandy clay loam	CL, SC	A-6, A-7	0	90-100	85-100	75-90	50-70	30-45	10-25
Chispa	12-44	Sandy clay loam, clay loam, loam.	CL	A-6, A-7	0	90-100	85-100	75-90	50-70	30-45	10-25
	44-60	Sandy loam, sandy clay loam, fine sandy loam.	SC, CL, SM-SC, CL-ML	A-4, A-6	0-5	85-100	80-100	50-90	35-60	20-35	5-15
117----------	0-12	Loamy fine sand	SM	A-2	0	100	100	75-90	20-30	---	NP
Berwolf	12-40	Fine sandy loam, sandy loam.	SM	A-2	0	100	100	65-80	25-35	20-25	NP-5
	40-60	Fine sandy loam, loamy fine sand.	SM	A-2, A-4	0	100	100	75-90	20-40	20-25	NP-5
118----------	0-7	Fine sandy loam	SM	A-2, A-4	0	100	100	75-90	30-40	20-25	NP-5
Berwolf	7-40	Fine sandy loam, sandy loam.	SM	A-2	0	100	100	65-80	25-35	20-25	NP-5
	40-60	Fine sandy loam, loamy fine sand.	SM	A-2, A-4	0	100	100	75-90	20-40	20-25	NP-5

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
									K	T		
	In	Pct	G/cm	In/hr	In/in	pH	mmhos/cm					Pct
12*:												
Ima	0-7	5-18	1.35-1.45	2.0-6.0	0.11-0.15	7.4-7.8	---	Low	0.28	5	3	1-2
	7-60	8-18	1.45-1.55	2.0-6.0	0.11-0.15	7.4-8.4	<2	Low	0.28			
Armesa	0-3	10-20	1.35-1.45	2.0-6.0	0.13-0.15	7.9-8.4	<2	Low	0.28	5	3	1-3
	3-60	15-25	1.45-1.55	0.6-2.0	0.14-0.16	7.9-8.4	<2	Low	0.43			
14*:												
Kolar	0-4	8-16	1.40-1.50	2.0-6.0	0.15-0.17	7.9-8.4	<2	Low	0.55	1	3	.5-1
	4-18	9-18	1.45-1.55	2.0-6.0	0.11-0.13	7.9-8.4	<2	Low	0.28			
	18	---	---	---	---	---	---	---	---			
Chispa	0-8	15-20	1.35-1.55	2.0-6.0	0.10-0.15	7.9-8.4	<2	Low	0.28	5	3	1-2
	8-35	25-35	1.35-1.50	0.6-2.0	0.12-0.18	7.9-8.4	<4	Low	0.32			
	35-60	15-35	1.35-1.50	0.6-2.0	0.08-0.15	7.9-8.4	<8	Low	0.32			
Neso	0-5	10-20	1.35-1.45	2.0-6.0	0.10-0.12	7.9-8.4	<2	Low	0.15	1	4	1-2
	5-14	10-20	1.40-1.50	2.0-6.0	0.07-0.09	7.9-8.4	<2	Low	0.10			
	14	---	---	---	---	---	---	---	---			
16*:												
Roswell	0-13	4-8	1.40-1.50	6.0-20	0.05-0.07	6.6-7.8	<2	Low	0.17	5	1	.5-1
	13-60	4-10	1.40-1.50	6.0-20	0.06-0.09	6.6-8.4	<2	Low	0.20			
Berwolf	0-16	5-12	1.30-1.40	2.0-6.0	0.09-0.10	7.4-7.8	<2	Low	0.20	5	2	.9-2
	16-35	10-18	1.45-1.55	2.0-6.0	0.12-0.14	7.9-8.4	<2	Low	0.28			
	35-60	7-15	1.45-1.55	2.0-6.0	0.13-0.15	7.9-8.4	<2	Low	0.28			
17	0-11	5-12	1.30-1.40	2.0-6.0	0.09-0.10	7.4-7.8	<2	Low	0.20	5	2	.9-2
Berwolf	11-36	10-18	1.45-1.55	2.0-6.0	0.12-0.14	7.9-8.4	<2	Low	0.28			
	36-60	7-15	1.45-1.55	2.0-6.0	0.13-0.15	7.9-8.4	<2	Low	0.28			
21*:												
Holloman	0-13	20-27	1.20-1.30	0.6-2.0	0.15-0.17	7.4-8.4	4-16	Low	0.37	1	4L	.4-.6
	13	---	---	---	---	---	---	---	---			
Rock outcrop.												
24*:												
Tucumcari	0-5	27-35	1.30-1.40	0.2-0.6	0.19-0.21	6.6-8.4	<2	Moderate	0.32	5	4L	1-2
	5-60	35-50	1.25-1.35	0.2-0.6	0.14-0.21	7.4-8.4	2-4	High	0.32			
Montoya	0-3	30-40	1.40-1.50	0.2-0.6	0.19-0.21	7.4-8.4	2-8	Moderate	0.32	5	4	1-2
	3-60	35-60	1.30-1.40	<0.06	0.14-0.16	7.4-8.4	2-8	High	0.28			
25*:												
Chispa	0-10	15-27	1.35-1.50	0.6-2.0	0.12-0.18	7.9-8.4	<2	Low	0.37	5	4L	1-2
	10-38	25-35	1.35-1.50	0.6-2.0	0.12-0.18	7.9-8.4	<4	Low	0.32			
	38-60	15-35	1.35-1.50	0.6-2.0	0.08-0.15	7.9-8.4	<8	Low	0.32			
Gallen	0-6	10-20	1.35-1.45	2.0-6.0	0.12-0.14	7.4-8.4	<2	Low	0.20	2	5	1-2
	6-21	10-18	1.40-1.50	2.0-6.0	0.06-0.08	7.9-9.0	<2	Low	0.10			
	21-33	5-10	1.40-1.50	2.0-6.0	0.5-0.7	7.4-8.4	<2	Low	0.10			
	33-60	1-5	1.40-1.50	6.0-20	0.04-0.06	7.4-8.4	<2	Low	0.05			
26*:												
Holloman	0-14	18-27	1.20-1.30	0.6-2.0	0.18-0.20	7.4-8.4	4-16	Low	0.43	1	4L	.4-.6
	14	---	---	---	---	---	---	---	---			

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
									K	T		
	In	Pct	G/cm	In/hr	In/in	pH	mmhos/cm					Pct
26*:												
Reeves	0-15	18-27	1.35-1.45	0.6-2.0	0.14-0.16	7.9-9.0	2-8	Moderate	0.37	2	4L	.4-.6
	15-35	18-30	1.40-1.50	0.6-2.0	0.15-0.17	7.9-9.0	2-8	Moderate	0.37			
	35	---	---	---	---	---	---	---	---			
27*:												
Los Tanos	0-5	8-17	1.45-1.55	2.0-6.0	0.12-0.14	7.4-8.4	<2	Low	0.28	2	3	.3-.5
	5-21	8-18	1.45-1.55	2.0-6.0	0.13-0.15	7.4-8.4	<2	Low	0.32			
	21	---	---	---	---	---	---	---	---			
Latom	0-8	5-18	1.35-1.55	2.0-6.0	0.10-0.15	7.9-8.4	<2	Low	0.28	1	3	<1
	8	---	---	---	---	---	---	---	---			
30. Ustifluvents												
31*:												
Chispa	0-7	15-20	1.35-1.55	2.0-6.0	0.10-0.15	7.9-8.4	<2	Low	0.28	5	3	1-2
	7-43	25-35	1.35-1.50	0.6-2.0	0.12-0.18	7.9-8.4	<4	Low	0.32			
	43-60	15-35	1.35-1.50	0.6-2.0	0.08-0.15	7.9-8.4	<8	Low	0.32			
Redona	0-8	10-15	1.35-1.45	2.0-6.0	0.12-0.14	7.4-8.4	<2	Low	0.28	5	3	1-2
	8-60	20-35	1.40-1.50	0.6-2.0	0.17-0.19	7.4-8.4	<2	Moderate	0.32			
32	0-6	15-29	1.25-1.50	0.6-2.0	0.12-0.18	6.6-8.4	<2	Low	0.32	2	5	1-3
Friona	6-26	20-35	1.40-1.60	0.6-2.0	0.14-0.19	7.4-8.4	<2	Low	0.32			
	26	---	---	---	---	---	---	---	---			
34*:												
Gallen	0-8	10-18	1.35-1.45	2.0-6.0	0.08-0.10	7.4-8.4	<2	Low	0.10	2	6	1-2
	8-40	10-18	1.40-1.50	2.0-6.0	0.06-0.08	7.9-9.0	<2	Low	0.10			
	40-60	1-5	1.40-1.50	6.0-20	0.04-0.06	7.4-8.4	<2	Low	0.05			
Torriorthents.												
35*:												
Tucumcari	0-7	20-35	1.40-1.50	0.6-2.0	0.14-0.17	6.6-8.4	<2	Moderate	0.32	5	5	.5-1
	7-60	35-50	1.25-1.35	0.2-0.6	0.14-0.21	7.4-8.4	2-4	High	0.32			
Redona	0-5	15-25	1.30-1.40	0.6-2.0	0.15-0.17	7.4-8.4	<2	Low	0.32	5	5	1-2
	5-60	20-35	1.40-1.50	0.6-2.0	0.17-0.19	7.4-8.4	<2	Moderate	0.32			
36*: Rock outcrop.												
Regnier	0-8	20-35	1.40-1.50	0.2-0.6	0.11-0.13	8.5-9.0	<2	Moderate	0.15	1	6	.5-1
	8-16	20-35	1.45-1.55	0.2-0.6	0.17-0.19	8.5-9.0	2-4	Moderate	0.32			
	16	---	---	---	---	---	---	---	---			
Latom	0-8	5-18	1.35-1.55	2.0-6.0	0.10-0.15	7.9-8.4	<2	Low	0.24	1	3	<1
	8	---	---	---	---	---	---	---	---			
37*:												
Ima	0-12	5-18	1.35-1.45	2.0-6.0	0.11-0.15	7.4-7.8	---	Low	0.28	5	3	1-2
	12-60	8-18	1.45-1.55	2.0-6.0	0.11-0.15	7.4-8.4	<2	Low	0.28			
Gallen	0-5	10-18	1.35-1.45	2.0-6.0	0.09-0.11	7.4-8.4	<2	Low	0.15	2	4	1-2
	5-20	10-18	1.40-1.50	2.0-6.0	0.06-0.08	7.9-9.0	<2	Low	0.10			
	20-60	1-5	1.40-1.50	6.0-20	0.04-0.06	7.4-8.4	<2	Low	0.05			
39*:												
Sharvana	0-13	10-20	1.35-1.55	0.6-2.0	0.11-0.15	6.6-8.4	<2	Low	0.28	1	3	<1
	13	---	---	---	---	---	---	---	---			

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
									K	T		
	In	Pct	G/cm	In/hr	In/in	pH	mmhos/cm					Pct
39*:												
Slaughter	0-2	20-30	1.30-1.50	0.6-2.0	0.14-0.16	6.6-8.4	<2	Low	0.32	1	5	1-3
	2-17	35-45	1.30-1.50	0.2-0.6	0.13-0.19	6.6-8.4	<2	Moderate	0.32			
	17	---	---	---	---	---	---	---	---			
40*:												
Pastura	0-4	20-27	1.15-1.25	0.6-2.0	0.16-0.18	7.9-8.4	<2	Moderate	0.37	1	4L	1-2
	4-10	18-35	1.20-1.30	0.6-2.0	0.14-0.16	7.9-8.4	<2	Moderate	0.28			
	10	---	---	---	---	---	---	---	---			
Darvey	0-6	20-27	1.30-1.40	0.6-2.0	0.16-0.18	7.9-8.4	<2	Low	0.37	5	4L	1-2
	6-60	20-35	1.40-1.50	0.6-2.0	0.17-0.20	7.9-8.4	<2	Moderate	0.37			
41*:												
Clovis	0-3	15-25	1.30-1.40	0.6-2.0	0.16-0.18	6.6-7.8	<2	Low	0.37	5	5	1-2
	3-29	20-35	1.40-1.50	0.6-2.0	0.14-0.18	6.6-8.4	<2	Moderate	0.32			
	29-60	9-17	1.45-1.55	2.0-6.0	0.15-0.17	7.9-8.4	<2	Low	0.43			
Pastura	0-3	20-27	1.15-1.25	0.6-2.0	0.16-0.18	7.9-8.4	<2	Moderate	0.37	1	4L	1-2
	3-15	18-35	1.20-1.30	0.6-2.0	0.14-0.16	7.9-8.4	<2	Moderate	0.28			
	15	---	---	---	---	---	---	---	---			
48*:												
Berwolf	0-11	7-15	1.35-1.45	2.0-6.0	0.13-0.15	7.4-7.8	<2	Low	0.28	5	3	1-2
	11-45	10-18	1.45-1.55	2.0-6.0	0.12-0.14	7.9-8.4	<2	Low	0.28			
	45-60	7-15	1.45-1.55	2.0-6.0	0.13-0.15	7.9-8.4	<2	Low	0.28			
Sharvana	0-4	10-20	1.35-1.55	2.0-6.0	0.11-0.15	6.6-8.4	<2	Low	0.28	1	3	<1
	4-12	20-30	1.30-1.50	0.6-2.0	0.12-0.17	7.4-8.4	<2	Low	0.32			
	12	---	---	---	---	---	---	---	---			
49	0-9	5-12	1.50-1.60	6.0-20	0.09-0.11	7.9-8.4	<2	Low	0.20	2	2	.5-1
Pojo	9-25	8-16	1.45-1.55	2.0-6.0	0.13-0.15	7.9-8.4	<2	Low	0.28			
	25	---	---	---	---	---	---	---	---			
50*:												
Berwolf	0-6	5-12	1.30-1.40	2.0-6.0	0.09-0.10	7.4-7.8	<2	Low	0.20	5	2	.9-2
	6-36	10-18	1.45-1.55	2.0-6.0	0.12-0.14	7.9-8.4	<2	Low	0.28			
	36-60	7-15	1.45-1.55	2.0-6.0	0.13-0.15	7.9-8.4	<2	Low	0.28			
Chispa	0-10	15-20	1.35-1.55	2.0-6.0	0.10-0.15	7.9-8.4	<2	Low	0.28	5	3	1-2
	10-42	25-35	1.35-1.50	0.6-2.0	0.12-0.18	7.9-8.4	<4	Low	0.32			
	42-60	15-35	1.35-1.50	0.6-2.0	0.08-0.15	7.9-8.4	<8	Low	0.32			
Armesa	0-15	10-20	1.35-1.45	2.0-6.0	0.13-0.15	7.9-8.4	<2	Low	0.28	5	3	1-3
	15-60	15-25	1.45-1.55	0.6-2.0	0.14-0.16	7.9-8.4	<2	Low	0.43			
51*:												
Regnier	0-9	28-35	1.40-1.50	0.2-0.6	0.19-0.21	8.5-9.0	<2	Moderate	0.32	1	4L	.5-1
	9-18	20-35	1.45-1.55	0.2-0.6	0.17-0.19	8.5-9.0	2-4	Moderate	0.32			
	18	---	---	---	---	---	---	---	---			
Latom	0-7	5-18	1.35-1.55	2.0-6.0	0.10-0.15	7.9-8.4	<2	Low	0.28	1	3	<1
	7	---	---	---	---	---	---	---	---			
Rock outcrop.												
52*:												
Latom	0-3	5-10	1.40-1.60	6.0-20	0.08-0.10	7.9-8.4	<2	Low	0.20	1	2	<1
	3-7	10-15	1.35-1.55	0.6-2.0	0.13-0.15	7.9-8.4	<2	Low	0.28			
	7	---	---	---	---	---	---	---	---			
Berwolf	0-16	5-12	1.30-1.40	2.0-6.0	0.09-0.10	7.4-7.8	<2	Low	0.20	5	2	.9-2
	16-33	10-18	1.45-1.55	2.0-6.0	0.12-0.14	7.9-8.4	<2	Low	0.28			
	33-60	7-15	1.45-1.55	2.0-6.0	0.13-0.15	7.9-8.4	<2	Low	0.28			

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
									K	T		
	In	Pct	G/cm	In/hr	In/in	pH	mmhos/cm					Pct
53----------	0-3	2-7	1.50-1.60	6.0-20	0.09-0.10	7.4-7.8	<2	Low-------	0.20	1	2	.8-1
Cardenas	3-14	5-16	1.40-1.50	2.0-6.0	0.14-0.16	7.9-8.4	<2	Low-------	0.28			
	14	---	---	---	---	---	---	----------	----			
55----------	0-6	20-27	1.30-1.40	0.6-2.0	0.16-0.18	7.9-8.4	<2	Low-------	0.37	5	4L	1-2
Darvey	6-60	20-35	1.40-1.50	0.6-2.0	0.17-0.20	7.9-8.4	<2	Moderate	0.37			
56*:												
Tucumcari-------	0-8	28-35	1.30-1.40	0.2-0.6	0.19-0.21	6.6-8.4	<2	Moderate	0.32	5	4L	1-2
	8-60	35-50	1.25-1.35	0.2-0.6	0.14-0.21	7.4-8.4	2-4	High------	0.32			
Hassell---------	0-5	30-40	1.20-1.30	0.2-0.6	0.19-0.21	7.4-7.8	<2	Moderate	0.32	3	4	1-2
	5-32	35-50	1.40-1.50	0.06-0.2	0.16-0.20	7.9-8.4	<2	High------	0.37			
	32	---	---	---	---	---	---	----------	----			
57*:												
Latom----------	0-7	5-18	1.35-1.55	0.6-2.0	0.10-0.15	7.9-8.4	<2	Low-------	0.28	1	3	<1
	7	---	---	---	---	---	---	----------	----			
Rock outcrop.												
58*:												
Redona----------	0-6	20-25	1.30-1.40	0.6-2.0	0.15-0.17	7.4-8.4	<2	Low-------	0.32	5	5	1-2
	6-60	20-35	1.40-1.50	0.6-2.0	0.17-0.19	7.4-8.4	<2	Moderate	0.32			
Armesa----------	0-2	20-30	1.30-1.40	0.6-2.0	0.14-0.16	7.9-8.4	<2	Low-------	0.32	5	4L	1-3
	2-60	15-25	1.45-1.55	0.6-2.0	0.14-0.16	7.9-8.4	<2	Low-------	0.43			
59*:												
Chispa----------	0-4	15-20	1.35-1.55	2.0-6.0	0.10-0.15	7.9-8.4	<2	Low-------	0.28	5	3	1-2
	4-23	25-35	1.35-1.50	0.6-2.0	0.12-0.18	7.9-8.4	<4	Low-------	0.32			
	23-60	15-35	1.35-1.50	0.6-2.0	0.08-0.15	7.9-8.4	<8	Low-------	0.32			
Los Tanos-------	0-8	8-17	1.45-1.55	2.0-6.0	0.12-0.14	7.4-8.4	<2	Low-------	0.28	2	3	.3-.5
	8-34	8-18	1.45-1.55	2.0-6.0	0.13-0.15	7.4-8.4	<2	Low-------	0.32			
	34	---	---	---	---	---	---	----------	----			
60*:												
Chispa----------	0-7	15-20	1.35-1.55	2.0-6.0	0.10-0.15	7.9-8.4	<2	Low-------	0.28	5	3	1-2
	7-32	25-35	1.35-1.50	0.6-2.0	0.12-0.18	7.9-8.4	<4	Low-------	0.32			
	32-60	15-35	1.35-1.50	0.6-2.0	0.08-0.15	7.9-8.4	<8	Low-------	0.32			
Armesa----------	0-10	10-20	1.35-1.45	2.0-6.0	0.13-0.16	7.9-8.4	<2	Low-------	0.28	5	3	1-3
	10-60	15-25	1.45-1.55	0.6-2.0	0.14-0.16	7.9-8.4	<2	Low-------	0.37			
Redona----------	0-6	10-15	1.35-1.45	2.0-6.0	0.12-0.14	7.4-8.4	<2	Low-------	0.28	5	3	1-2
	6-60	20-35	1.40-1.50	0.6-2.0	0.17-0.19	7.4-8.4	<2	Moderate	0.32			
61*:												
Berwolf----------	0-11	5-12	1.30-1.40	2.0-6.0	0.09-0.10	7.4-7.8	<2	Low-------	0.20	5	2	.9-2
	11-42	10-18	1.45-1.55	2.0-6.0	0.12-0.14	7.9-8.4	<2	Low-------	0.28			
	42-60	7-15	1.45-1.55	2.0-6.0	0.13-0.15	7.9-8.4	<2	Low-------	0.28			
Roswell----------	0-8	4-8	1.40-1.50	6.0-20	0.05-0.07	6.6-7.8	<2	Low-------	0.17	5	1	.5-1
	8-60	4-10	1.40-1.50	6.0-20	0.06-0.09	6.6-8.4	<2	Low-------	0.20			
62*:												
Regnier----------	0-2	28-35	1.40-1.50	0.2-0.6	0.19-0.21	8.5-9.0	<2	Moderate	0.32	1	4L	.5-1
	2-17	20-35	1.45-1.55	0.2-0.6	0.17-0.19	8.5-9.0	2-4	Moderate	0.32			
	17	---	---	---	---	---	---	----------	----			
Latom----------	0-9	5-18	1.40-1.60	0.6-2.0	0.10-0.15	7.9-8.4	<2	Low-------	0.15	1	4	<1
	9	---	---	---	---	---	---	----------	----			
Rock outcrop.												

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
									K	T		
	In	Pct	G/cm	In/hr	In/in	pH	mmhos/cm					Pct
63*:												
Neso	0-6	10-20	1.35-1.45	2.0-6.0	0.07-0.09	7.9-8.4	<2	Low	0.10	1	4L	.1-2
	6-12	10-20	1.40-1.50	2.0-6.0	0.07-0.09	7.9-8.4	<2	Low	0.10			
	12	---	---	---	---	---	---	---	---			
Kolar	0-9	8-16	1.40-1.50	2.0-6.0	0.13-0.15	7.9-8.4	<2	Low	0.28	1	3	.5-1
	9-14	9-18	1.45-1.55	2.0-6.0	0.11-0.13	7.9-8.4	<2	Low	0.28			
	14	---	---	---	---	---	---	---	---			
64	0-7	7-15	1.35-1.45	2.0-6.0	0.13-0.15	7.4-7.8	<2	Low	0.28	5	3	1-2
Berwolf	7-39	10-18	1.45-1.55	2.0-6.0	0.12-0.14	7.9-8.4	<2	Low	0.28			
	39-60	7-15	1.45-1.55	2.0-6.0	0.13-0.15	7.9-8.4	<2	Low	0.28			
66*:												
Pojo	0-5	5-12	1.50-1.60	6.0-20	0.09-0.11	7.9-8.4	<2	Low	0.20	2	2	.5-1
	5-29	8-16	1.45-1.55	2.0-6.0	0.13-0.15	7.9-8.4	<2	Low	0.28			
	29	---	---	---	---	---	---	---	---			
Kolar	0-6	5-12	1.45-1.55	2.0-6.0	0.09-0.11	7.9-8.4	<2	Low	0.20	1	2	.5-1
	6-15	9-18	1.45-1.55	2.0-6.0	0.11-0.13	7.9-8.4	<2	Low	0.28			
	15	---	---	---	---	---	---	---	---			
67*:												
Kolar	0-3	8-16	1.40-1.50	2.0-6.0	0.13-0.15	7.9-8.4	<2	Low	0.28	1	3	.5-1
	3-17	9-18	1.45-1.55	2.0-6.0	0.11-0.13	7.9-8.4	<2	Low	0.28			
	17	---	---	---	---	---	---	---	---			
Neso	0-4	10-20	1.35-1.45	2.0-6.0	0.07-0.09	7.9-8.4	<2	Low	0.10	1	4L	.1-2
	4-11	10-20	1.40-1.50	2.0-6.0	0.07-0.09	7.9-8.4	<2	Low	0.10			
	11	---	---	---	---	---	---	---	---			
Pojo	0-5	8-16	1.35-1.45	2.0-6.0	0.13-0.15	7.9-8.4	<2	Low	0.28	2	3	.8-2
	5-32	8-16	1.45-1.55	2.0-6.0	0.13-0.15	7.9-8.4	<2	Low	0.28			
	32	---	---	---	---	---	---	---	---			
68	0-8	10-20	1.35-1.45	0.6-2.0	0.15-0.17	7.4-8.4	2-4	Low	0.55	5	3	1-2
Poquita	8-60	18-35	1.20-1.30	0.6-2.0	0.16-0.20	7.4-8.4	2-4	Moderate	0.37			
69*:												
Deama	0-7	18-27	1.30-1.40	0.6-2.0	0.10-0.12	7.9-8.4	<2	Low	0.20	1	5	1-3
	7-13	18-27	1.40-1.50	0.6-2.0	0.04-0.09	7.9-8.4	<2	Low	0.17			
	13	---	---	---	---	---	---	---	---			
Darvey	0-6	20-27	1.30-1.40	0.6-2.0	0.16-0.18	7.9-8.4	<2	Low	0.37	5	4L	1-2
	6-60	20-35	1.40-1.50	0.6-2.0	0.17-0.20	7.9-8.4	<2	Moderate	0.37			
71	0-8	18-27	1.40-1.50	0.6-2.0	0.14-0.16	7.4-9.0	<2	Low	0.37	2	4L	1-2
San Jon	8-33	24-35	1.40-1.50	0.2-0.6	0.13-0.15	7.4-9.0	<2	Moderate	0.37			
	33	---	---	---	---	---	---	---	---			
72*:												
Lozier	0-13	18-27	1.30-1.50	0.6-2.0	0.05-0.10	7.9-8.4	<2	Low	0.10	1	6	<1
	13	---	---	---	---	---	---	---	---			
Rock outcrop.												
73*:												
Reeves	0-7	18-27	1.35-1.45	0.6-2.0	0.14-0.16	7.9-9.0	2-8	Low	0.55	2	4L	.4-.6
	7-28	18-30	1.40-1.50	0.6-2.0	0.15-0.17	7.9-9.0	2-8	Moderate	0.37			
	28	---	---	---	---	---	---	---	---			
Holloman	0-19	20-27	1.20-1.30	0.6-2.0	0.15-0.17	7.4-8.4	4-16	Low	0.37	1	4L	.4-.6
	19	---	---	---	---	---	---	---	---			

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
									K	T		
	In	Pct	G/cm	In/hr	In/in	pH	mmhos/cm					Pct
102----------	0-7	10-15	1.35-1.45	2.0-6.0	0.12-0.14	7.4-8.4	<2	Low--------	0.28	5	3	1-2
Redona	7-60	20-35	1.40-1.50	0.6-2.0	0.17-0.19	7.4-8.4	<2	Moderate	0.32			
103----------	0-11	15-20	1.35-1.55	2.0-6.0	0.10-0.15	7.9-8.4	<2	Low--------	0.28	5	3	1-2
Chispa	11-46	25-35	1.35-1.50	0.6-2.0	0.12-0.18	7.9-8.4	<4	Low--------	0.32			
	46-60	15-35	1.35-1.50	0.6-2.0	0.08-0.15	7.9-8.4	<8	Low--------	0.32			
105----------	0-6	30-40	1.40-1.50	0.2-0.6	0.19-0.21	7.4-8.4	2-8	Moderate	0.32	5	4	1-2
Montoya	6-60	35-60	1.30-1.40	<0.06	0.14-0.16	7.4-8.4	2-8	High------	0.28			
106----------	0-10	10-18	1.35-1.45	2.0-6.0	0.10-0.15	7.4-7.8	<2	Low--------	0.28	5	3	1-2
La Lande	10-60	20-35	1.40-1.50	0.6-2.0	0.14-0.16	7.9-8.4	<2	Moderate	0.32			
107----------	0-10	5-18	1.35-1.45	2.0-6.0	0.11-0.15	7.4-7.8	---	Low--------	0.28	5	3	1-2
Ima	10-60	8-18	1.45-1.55	2.0-6.0	0.11-0.15	7.4-8.4	<2	Low--------	0.28			
108----------	0-4	5-12	1.30-1.40	6.0-20	0.09-0.11	7.9-8.4	<2	Low--------	0.20	5	2	1-3
Armesa	4-31	15-25	1.45-1.55	0.6-2.0	0.14-0.16	7.9-8.4	<2	Low--------	0.32			
	31-60	20-30	1.45-1.55	0.6-2.0	0.13-0.15	7.9-8.4	<2	Low--------	0.20			
109----------	0-4	5-12	1.30-1.40	6.0-20	0.09-0.11	7.9-8.4	<2	Low--------	0.20	5	2	1-3
Armesa	4-60	15-25	1.45-1.55	0.6-2.0	0.14-0.16	7.9-8.4	<2	Low--------	0.32			
110----------	0-8	10-20	1.45-1.50	2.0-6.0	0.13-0.15	7.4-7.8	<2	Low--------	0.28	5	3	.5-.9
Minneosa	8-38	5-10	1.40-1.50	2.0-6.0	0.09-0.10	7.4-7.8	<2	Low--------	0.20			
	38-60	2-5	1.40-1.50	>20	0.05-0.07	7.4-7.8	---	Low--------	0.10			
111----------	0-40	20-35	1.35-1.45	0.6-2.0	0.14-0.16	7.4-7.8	<2	Moderate	0.32	5	5	.5-.9
La Lande	40-60	5-15	1.45-1.55	6.0-20	0.04-0.06	7.4-8.4	<2	Low--------	0.05			
112----------	0-10	20-30	1.15-1.25	0.6-2.0	0.14-0.16	7.4-7.8	<2	Low--------	0.32	5	6	1-2
La Lande	10-40	18-35	1.40-1.50	0.6-2.0	0.16-0.18	7.9-8.4	<2	Moderate	0.37			
	40-60	18-30	1.40-1.50	0.6-2.0	0.15-0.17	7.9-8.4	<2	Low--------	0.37			
113----------	0-10	20-35	1.30-1.40	0.6-2.0	0.14-0.16	7.4-7.8	<2	Moderate	0.32	5	5	1-2
Montoya Variant	10-18	10-18	1.45-1.55	2.0-6.0	0.13-0.15	7.4-8.4	<2	Low--------	0.28			
	18-60	35-60	1.30-1.40	<0.06	0.16-0.18	7.4-8.4	2-4	High------	0.32			
114----------	0-18	10-15	1.35-1.45	2.0-6.0	0.13-0.15	7.4-7.8	<2	Low--------	0.28	5	3	1-2
Montoya Variant	18-60	35-60	1.30-1.40	<0.06	0.16-0.18	7.4-8.4	2-4	High------	0.32			
115----------	0-14	20-35	1.40-1.50	0.6-2.0	0.14-0.16	7.4-7.8	<2	Moderate	0.32	5	5	.5-.9
Minneosa	14-27	10-15	1.45-1.55	2.0-6.0	0.13-0.15	7.4-7.8	<2	Low--------	0.28			
	27-35	5-10	1.40-1.50	2.0-6.0	0.09-0.10	7.4-7.8	<2	Low--------	0.20			
	35-60	2-5	1.40-1.50	>20	0.05-0.07	7.4-7.8	---	Low--------	0.10			
116----------	0-12	20-35	1.35-1.50	0.6-2.0	0.12-0.18	7.9-8.4	<2	Low--------	0.32	5	4L	1-2
Chispa	12-44	25-35	1.35-1.50	0.6-2.0	0.12-0.18	7.9-8.4	<4	Low--------	0.32			
	44-60	15-35	1.35-1.50	0.6-2.0	0.08-0.15	7.9-8.4	<8	Low--------	0.32			
117----------	0-12	5-12	1.30-1.40	2.0-6.0	0.09-0.10	7.4-7.8	<2	Low--------	0.20	5	2	.9-2
Berwolf	12-40	10-18	1.45-1.55	2.0-6.0	0.12-0.14	7.9-8.4	<2	Low--------	0.28			
	40-60	7-15	1.45-1.55	2.0-6.0	0.13-0.15	7.9-8.4	<2	Low--------	0.28			
118----------	0-7	7-15	1.35-1.45	2.0-6.0	0.13-0.15	7.4-7.8	<2	Low--------	0.28	5	3	1-2
Berwolf	7-40	10-18	1.45-1.55	2.0-6.0	0.12-0.14	7.9-8.4	<2	Low--------	0.28			
	40-60	7-15	1.45-1.55	2.0-6.0	0.13-0.15	7.9-8.4	<2	Low--------	0.28			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--SOIL AND WATER FEATURES

["Flooding" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated]

Soil name and map symbol	Hydrologic group	Frequency of flooding	Bedrock		Cemented pan		Potential frost action	Risk of corrosion	
			Depth	Hardness	Depth	Thickness		Uncoated steel	Concrete
			In		In				
12*:									
Ima	B	None	>60	---	---	---	Low	High	Low.
Armesa	B	None	>60	---	---	---	Low	High	Low.
14*:									
Kolar	D	None	>60	---	10-20	Thick	Low	High	Low.
Chispa	B	None	>60	---	---	---	Low	High	Low.
Neso	D	None	>60	---	8-14	Thick	Low	High	Low.
16*:									
Roswell	A	None	>60	---	---	---	Low	Moderate	Low.
Berwolf	B	None	>60	---	---	---	Low	High	Low.
17--Berwolf	B	None	>60	---	---	---	Low	High	Low.
21*:									
Holloman	D	None	5-20	Soft	---	---	Low	High	High.
Rock outcrop.									
24*:									
Tucumcari	B	None	>60	---	---	---	Low	High	Low.
Montoya	D	Rare	>60	---	---	---	Low	High	Moderate
25*:									
Chispa	B	None	>60	---	---	---	Low	High	Low.
Gallen	B	None	>60	---	---	---	Low	High	Low.
26*:									
Holloman	D	None	5-20	Soft	---	---	Low	High	High.
Reeves	B	None	>60	---	---	---	Low	High	High.
27*:									
Los Tanos	C	None	20-40	Hard	---	---	Low	Moderate	Low.
Latom	D	None	5-20	Hard	---	---	Low	Moderate	Low.
30. Ustifluvents									
31*:									
Chispa	B	None	>60	---	---	---	Low	High	Low.
Redona	B	None	>60	---	---	---	Low	Moderate	Low.
32--Friona	C	None	>60	---	20-40	Thin	Low	Moderate	Low.
34*:									
Gallen	B	None	>60	---	---	---	Low	High	Low.
Torriorthents.									

See footnote at end of table.

TABLE 13.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Frequency of flooding	Bedrock		Cemented pan		Potential frost action	Risk of corrosion	
			Depth	Hardness	Depth	Thickness		Uncoated steel	Concrete
			In		In				
35*:									
Tucumcari	B	None	>60	---	---	---	Low	High	Low.
Redona	B	None	>60	---	---	---	Low	Moderate	Low.
36*:									
Rock outcrop.									
Regnier	D	None	12-20	Soft	---	---	Low	High	Low.
Latom	D	None	8-20	Hard	---	---	Low	Moderate	Low.
37*:									
Ima	B	None	>60	---	---	---	Low	High	Low.
Gallen	B	None	>60	---	---	---	Low	High	Low.
39*:									
Sharvana	C	None	>60	---	10-20	Thin	Low	Low	Low.
Slaughter	C	None	>60	---	10-20	Thin	Low	Moderate	Low.
40*:									
Pastura	D	None	>60	---	7-15	Thick	Low	High	Low.
Darvey	B	None	>60	---	---	---	Low	High	Low.
41*:									
Clovis	B	None	>60	---	---	---	Low	High	Low.
Pastura	D	None	>60	---	10-20	Thick	Low	High	Low.
48*:									
Berwolf	B	None	>60	---	---	---	Low	High	Low.
Sharvana	C	None	>60	---	10-20	Thin	Low	Low	Low.
49----------	C	None	>60	---	20-40	Thick	Low	High	Low.
Pojo									
50*:									
Berwolf	B	None	>60	---	---	---	Low	High	Low.
Chispa	B	None	>60	---	---	---	Low	High	Low.
Armesa	B	None	>60	---	---	---	Low	High	Low.
51*:									
Regnier	D	None	12-20	Soft	---	---	Low	High	Low.
Latom	D	None	7-20	Hard	---	---	Low	Moderate	Low.
Rock outcrop.									
52*:									
Latom	D	None	7-20	Hard	---	---	Low	Moderate	Low.
Berwolf	B	None	>60	---	---	---	Low	High	Low.
53----------	D	None	>60	---	10-20	Thick	Moderate	High	Low.
Cardenas									

See footnote at end of table.

TABLE 13.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Frequency of flooding	Bedrock		Cemented pan		Potential frost action	Risk of corrosion	
			Depth	Hardness	Depth	Thickness		Uncoated steel	Concrete
			In		In				
55---------- Darvey	B	None--------	>60	---	---	---	Low------	High-----	Low.
56*:									
Tucumcari--------	B	None--------	>60	---	---	---	Low------	High-----	Low.
Hassell----------	D	None--------	20-40	Soft	---	---	Low------	High-----	Low.
57*:									
Latom------------	D	None--------	7-20	Hard	---	---	Low------	Moderate	Low.
Rock outcrop.									
58*:									
Redona-----------	B	None--------	>60	---	---	---	Low------	Moderate	Low.
Armesa-----------	B	None--------	>60	---	---	---	Low------	High-----	Low.
59*:									
Chispa-----------	B	None--------	>60	---	---	---	Low------	High-----	Low.
Los Tanos--------	C	None--------	20-40	Hard	---	---	Low------	Moderate	Low.
60*:									
Chispa-----------	B	None--------	>60	---	---	---	Low------	High-----	Low.
Armesa-----------	B	None--------	>60	---	---	---	Low------	High-----	Low.
Redona-----------	B	None--------	>60	---	---	---	Low------	Moderate	Low.
61*:									
Berwolf----------	B	None--------	>60	---	---	---	Low------	High-----	Low.
Roswell----------	A	None--------	>60	---	---	---	Low------	Moderate	Low.
62*:									
Regnier----------	D	None--------	12-20	Soft	---	---	Low------	High-----	Low.
Latom------------	D	None--------	7-20	Hard	---	---	Low------	Moderate	Low.
Rock outcrop.									
63*:									
Neso-------------	D	None--------	>60	---	8-14	Thick	Low------	High-----	Low.
Kolar------------	D	None--------	>60	---	10-20	Thick	Low------	High-----	Low.
64---------- Berwolf	B	None--------	>60	---	---	---	Low------	High-----	Low.
66*:									
Pojo-------------	C	None--------	>60	---	20-40	Thick	Low------	High-----	Low.
Kolar------------	D	None--------	>60	---	10-20	Thick	Low------	High-----	Low.
67*:									
Kolar------------	D	None--------	>60	---	10-20	Thick	Low------	High-----	Low.
Neso-------------	D	None--------	>60	---	8-14	Thick	Low------	High-----	Low.
Pojo-------------	C	None--------	>60	---	20-40	Thick	Low------	High-----	Low.
68---------- Poquita	B	None--------	>60	---	---	---	Low------	High-----	Low.

See footnote at end of table.

TABLE 13.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Frequency of flooding	Bedrock		Cemented pan		Potential frost action	Risk of corrosion	
			Depth	Hardness	Depth	Thickness		Uncoated steel	Concrete
			In		In				
69*:									
Deama	D	None	13-16	Hard	---	---	Low	Moderate	Low.
Darvey	B	None	>60	---	---	---	Low	High	Low.
71 San Jon	C	None	20-40	Soft	---	---	Low	High	Low.
72*:									
Lozier	D	None	7-16	Hard	---	---	Low	High	Low.
Rock outcrop.									
73*:									
Reeves	B	None	>60	---	---	---	Low	High	High.
Holloman	D	None	6-19	Soft	---	---	Low	High	High.
102 Redona	B	None	>60	---	---	---	Low	Moderate	Low.
103 Chispa	B	None	>60	---	---	---	Low	High	Low.
105 Montoya	D	None	>60	---	---	---	Low	High	Moderate.
106 La Lande	B	None	>60	---	---	---	Moderate	High	Low.
107 Ima	B	None	>60	---	---	---	Low	High	Low.
108, 109 Armesa	B	None	>60	---	---	---	Low	High	Low.
110 Minneosa	B	None	>60	---	---	---	Low	Moderate	Low.
111 La Lande	B	None	>60	---	---	---	Low	High	Low.
112 La Lande	B	None	>60	---	---	---	Moderate	High	Low.
113, 114 Montoya Variant	C	None	>60	---	---	---	Low	High	Low.
115 Minneosa	B	None	>60	---	---	---	Low	Moderate	Low.
116 Chispa	B	None	>60	---	---	---	Low	High	Low.
117, 118 Berwolf	B	None	>60	---	---	---	Low	High	Low.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Armesa	Fine-loamy, carbonatic, thermic Ustollic Calciorthids
Berwolf	Coarse-loamy, mixed, thermic Ustollic Haplargids
Cardenas	Loamy, mixed, mesic, shallow Ustollic Paleorthids
Chispa	Fine-loamy, mixed, thermic Ustollic Calciorthids
Clovis	Fine-loamy, mixed, mesic Ustollic Haplargids
Darvey	Fine-loamy, mixed, mesic Ustollic Calciorthids
Deama	Loamy-skeletal, carbonatic, mesic Lithic Calciustolls
Friona	Fine-loamy, mixed, thermic Petrocalcic Paleustolls
Gallen	Loamy-skeletal, mixed, thermic Ustollic Calciorthids
Hassell	Fine, mixed, thermic Ustollic Haplargids
Holloman	Loamy, gypsic, thermic, shallow Typic Torriorthents
Ima	Coarse-loamy, mixed, thermic Ustollic Camborthids
Kolar	Loamy, mixed, thermic, shallow Ustollic Paleorthids
La Lande	Fine-loamy, mixed, thermic Ustollic Camborthids
Latom	Loamy, mixed (calcareous), thermic Lithic Ustic Torriorthents
Los Tanos	Coarse-loamy, mixed, thermic Ustochreptic Camborthids
Lozier	Loamy-skeletal, carbonatic, thermic Lithic Calciorthids
Minneosa	Sandy, mixed, thermic Ustic Torrifluvents
Montoya	Fine, mixed, thermic Mollic Torrerts
Montoya Variant	Coarse-loamy over clayey, mixed, thermic Ustollic Camborthids
Neso	Loamy-skeletal, carbonatic, thermic, shallow Ustollic Paleorthids
Pastura	Loamy, mixed, mesic, shallow Ustollic Paleorthids
Pojo	Coarse-loamy, mixed, thermic Petrocalcic Ustollic Paleargids
Poquita	Fine-silty, mixed, thermic Ustollic Calciorthids
Redona	Fine-loamy, mixed, thermic Ustollic Haplargids
Reeves	Fine-loamy, gypsic, thermic Typic Gypsiorthids
Regnier	Loamy, mixed (calcareous), thermic, shallow Ustic Torriorthents
Roswell	Mixed, thermic Ustic Torripsamments
San Jon	Fine-loamy, mixed, thermic Ustochreptic Calciorthids
Sharvana	Loamy, mixed, thermic, Petrocalcic Ustalfic Paleargids
Slaughter	Clayey, mixed, thermic, shallow Petrocalcic Paleustolls
Tucumcari	Fine, mixed, thermic Ustollic Haplargids

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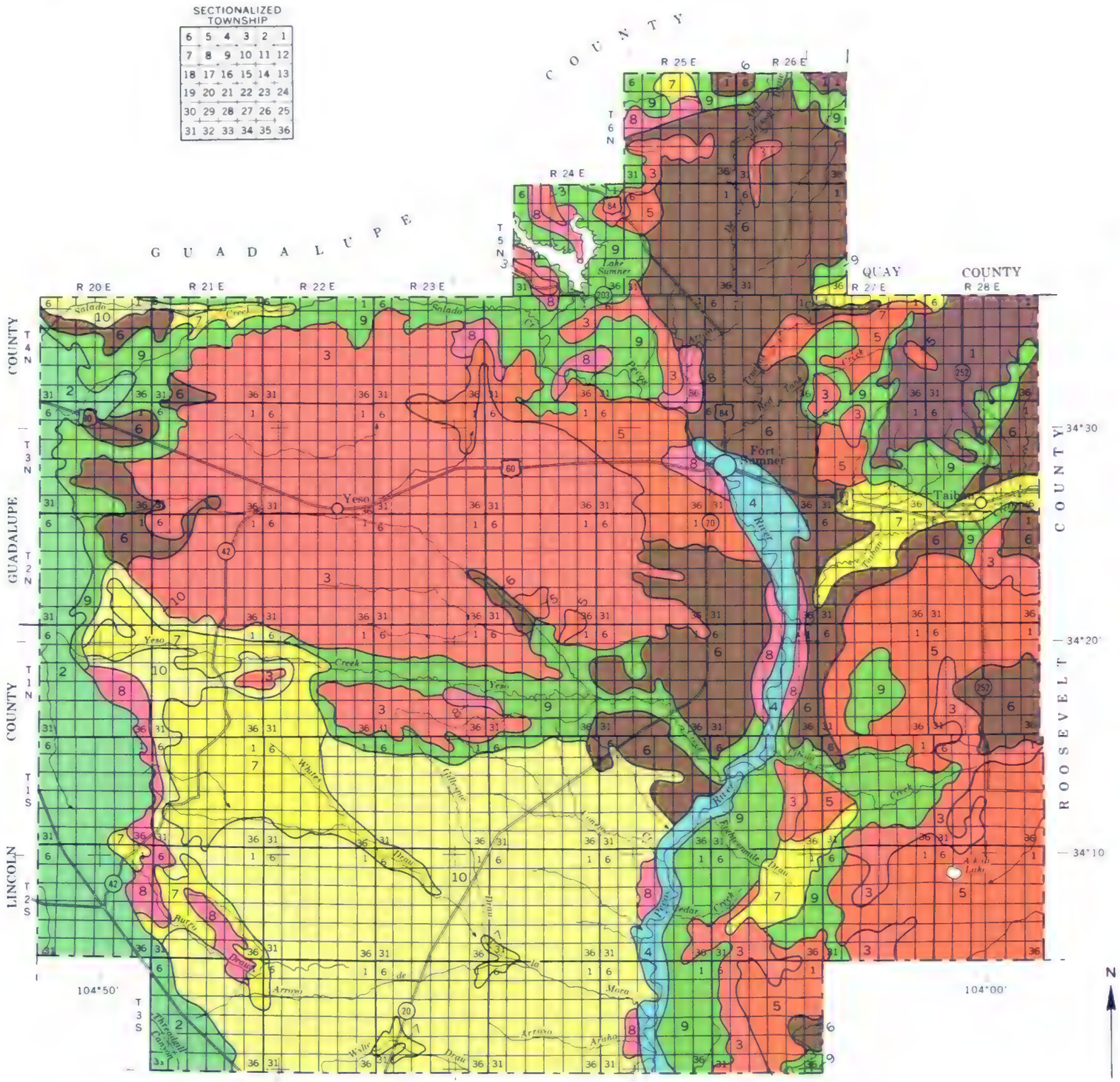
SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36



LEGEND

1 — SHARVANA-SLAUGHTER-FRIONA: Shallow and moderately deep, nearly level to gently sloping, well drained soils; on ridges and mesas and in swales

2 — PASTURA-DARVEY-CLOVIS: Very shallow, shallow, and deep, nearly level to strongly sloping, well drained soils; on uplands and in valleys

3 — KOLAR-POJO-NESO: Very shallow, shallow, and moderately deep, nearly level to gently sloping, well drained soils; on mesas

4 — USTIFLUVENTS-IMA: Deep, nearly level to gently sloping, well drained soils; mainly on flood plains and alluvial terraces

5 — BERWOLF-ROSWELL: Deep, nearly level to moderately steep, well drained soils; mainly on uplands

6 — CHISPA-REDONA-ARMESA: Deep, nearly level to strongly sloping, well drained soils; on uplands

7 — REDONA-TUCUMCARI-ARMESA: Deep, nearly level to gently sloping, well drained soils; in broad valleys and on uplands and basin floors

8 — GALLEN-CHISPA-IMA: Deep, gently sloping to steep, well drained soils; on alluvial terraces, hillslopes, and breaks

9 — REGNIER-LATOM-ROCK OUTCROP: Very shallow and shallow, nearly level to very steep, well drained soils, and Rock outcrop; on breaks hillslopes, and ridges

10 — HOLLOMAN-REEVES-POQUITA: Very shallow to deep, nearly level to steep, well drained soils; on uplands and alluvial flats

COMPILED 1984

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
UNITED STATES DEPARTMENT OF INTERIOR
BUREAU OF LAND MANAGEMENT
NEW MEXICO AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

DE BACA COUNTY, NEW MEXICO

Scale 1:190,080

1 0 1 2 3 Miles

1 0 3 6 Km

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Original text from each individual map sheet read:
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are Controlled photomosaics prepared from 1973 and 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

HIGH INTENSITY SOIL SURVEY AREA

INDEX TO MAP SHEETS

DE BACA COUNTY, NEW MEXICO

Scale 1:190,080

1 0 1 2 3 Miles

1 0 3 6 Km

N

34°30′
34°20′
34°10′
104°50′
104°40′
104°30′
104°20′
104°10′
104°00′

C H A V E S C O U N T Y
G U A D A L U P E C O U N T Y
L I N C O L N C O U N T Y
Q U A Y C O U N T Y

SOIL LEGEND

SYMBOL	NAME
12	Ima-Armesa association, 1 to 10 percent slopes
14	Kolar-Chispa-Neso association, 0 to 5 percent slopes
16	Roswell-Berwolf association, 3 to 20 percent slopes
17	Berwolf loamy fine sand, 0 to 5 percent slopes
21	Holloman-Rock outcrop complex, 15 to 35 percent slopes
24	Tucumcari-Montoya clay loams, 0 to 3 percent slopes
25	Chispa-Gallen association, 1 to 10 percent slopes
26	Holloman-Reeves complex, 1 to 15 percent slopes
27	Los Tanos-Latom fine sandy loams, 0 to 5 percent slopes
30	Ustifluvents, 0 to 3 percent slopes
31	Chispa-Redona association, 0 to 3 percent slopes
32	Friona sandy clay loam, 0 to 3 percent slopes
34	Gallen-Torriorthents association, 15 to 35 percent slopes
35	Tucumcari-Redona association, 0 to 3 percent slopes
36	Rock outcrop-Regnier-Latom complex, 30 to 80 percent slopes
37	Ima-Gallen association, 2 to 7 percent slopes
39	Sharvana-Slaughter association, 0 to 3 percent slopes
40	Pastura Darvey association, 1 to 10 percent slopes
41	Clovis-Pastura association, 0 to 5 percent slopes
48	Berwolf-Sharvana association, 0 to 3 percent slopes
49	Poyo loamy fine sand, 0 to 5 percent slopes
50	Berwolf-Chispa-Armesa association, 0 to 5 percent slopes
51	Regnier-Latom-Rock outcrop complex, 1 to 15 percent slopes
52	Latom-Berwolf association, 0 to 10 percent slopes
53	Cardenas loamy fine sand, 1 to 15 percent slopes
55	Darvey loam, 0 to 5 percent slopes
56	Tucumcari-Hassell clay loams, 0 to 5 percent slopes
57	Latom-Rock outcrop complex, 3 to 20 percent slopes
58	Redona-Armesa association, 0 to 5 percent slopes
59	Chispa-Los Tanos fine sandy loams, 0 to 5 percent slopes
60	Chispa-Armesa-Redona association, 2 to 7 percent slopes
61	Berwolf-Roswell association, 1 to 15 percent slopes
62	Regnier-Latom-Rock outcrop complex, 15 to 35 percent slopes
63	Neso-Kolar association, 0 to 5 percent slopes
64	Berwolf fine sandy loam, 0 to 5 percent slopes
66	Poyo-Kolar loamy fine sands, 0 to 5 percent slopes
67	Kolar-Neso-Poyo complex, 0 to 5 percent slopes
68	Poquita very fine sandy loam, 0 to 5 percent slopes
69	Deama-Darvey association, 1 to 10 percent slopes
71	San Jon loam, 0 to 5 percent slopes
72	Lozier-Rock outcrop complex, 1 to 5 percent slopes
73	Reeves-Holloman association, 0 to 5 percent slopes
102	Redona fine sandy loam, 0 to 2 percent slopes
103	Chispa fine sandy loam, 0 to 2 percent slopes
105	Montoya clay loam, 0 to 1 percent slopes
106	La Lande fine sandy loam,0 to 1 percent slopes
107	Ima fine sandy loam, 0 to 3 percent slopes
108	Armesa loamy fine sand, 1 to 3 percent slopes
109	Armesa loamy fine sand, 3 to 5 percent slopes
110	Minneosa fine sandy loam, 0 to 2 percent slopes
111	La Lande sandy clay loam, gravelly substratum, 0 to 1 percent slopes
112	La Lande sandy clay loam, 0 to 1 percent slopes
113	Montoya Variant sandy clay loam, 0 to 1 percent slopes
114	Montoya Variant fine sandy loam, 0 to 1 percent slopes
115	Minneosa sandy clay loam, 0 to 1 percent slopes
116	Chispa sandy clay loam, 0 to 2 percent slopes
117	Berwolf loamy fine sand, 1 to 3 percent slopes
118	Berwolf fine sandy loam, 0 to 3 percent slopes
	Water

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline
- AD HOC BOUNDARY (label)
- Small airport, airfield, park, oilfield, cemetery, or flood pool
- STATE COORDINATE TICK
- LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEM & DESIGNATIONS

- Interstate (21)
- Federal (173)
- State (28)
- County, farm or ranch (1280)

- RAILROAD
- POWER TRANSMISSION LINE (normally not shown)
- PIPE LINE (normally not shown)
- FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small (water, w)

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label) (Indian Mound)
- Located object (label) (Tower)
- Tank (label) (Gas)
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label) (CANAL)
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial (water, w)
- Intermittent (int, i)

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

- SOIL DELINEATIONS AND SYMBOLS (41, 103)
- ESCARPMENTS
  - Bedrock (points down slope)
  - Other than bedrock (points down slope)
- SHORT STEEP SLOPE
- GULLY
- DEPRESSION OR SINK
- SOIL SAMPLE SITE (normally not shown) (S)
- MISCELLANEOUS
  - Blowout
  - Clay spot
  - Gravelly spot
  - Gumbo, slick or scabby spot (sodic)
  - Dumps and other similar non soil areas
  - Prominent hill or peak
  - Rock outcrop (includes sandstone and shale)
  - Saline spot
  - Sandy spot
  - Severely eroded spot
  - Slide or slip (tips point upslope)
  - Stony spot, very stony spot (0)
  - Exposed Gypsum

SOIL SURVEY OF DE BACA COUNTY, NEW MEXICO — SHEET NUMBER 1

510 000 FEET

R. 25 E. | R. 26 E.

1 390 000 FEET

T. 6 N.

(Joins West sheet 2)

GUADALUPE COUNTY

Arroyo Colorado

Anil Jackson Draw

Arroyo de

COUNTY

(Joins sheet 3)

369 000 FEET

N

5 MILES

7 KILOMETERS

SCALE 1:48 000

(2)

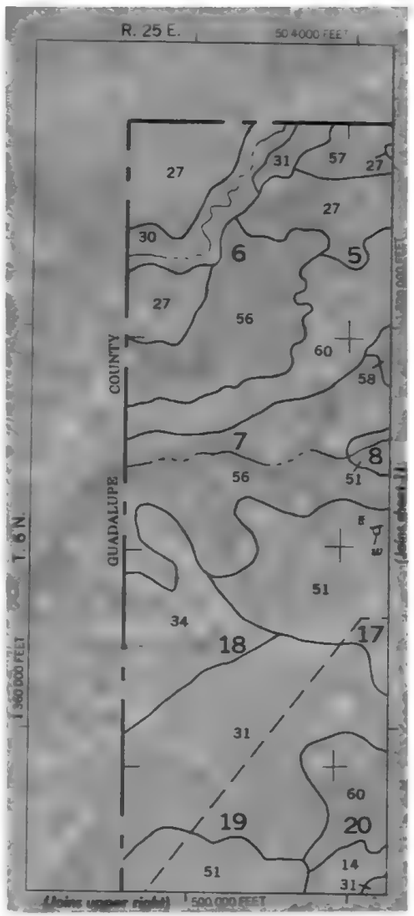
N

5 MILES

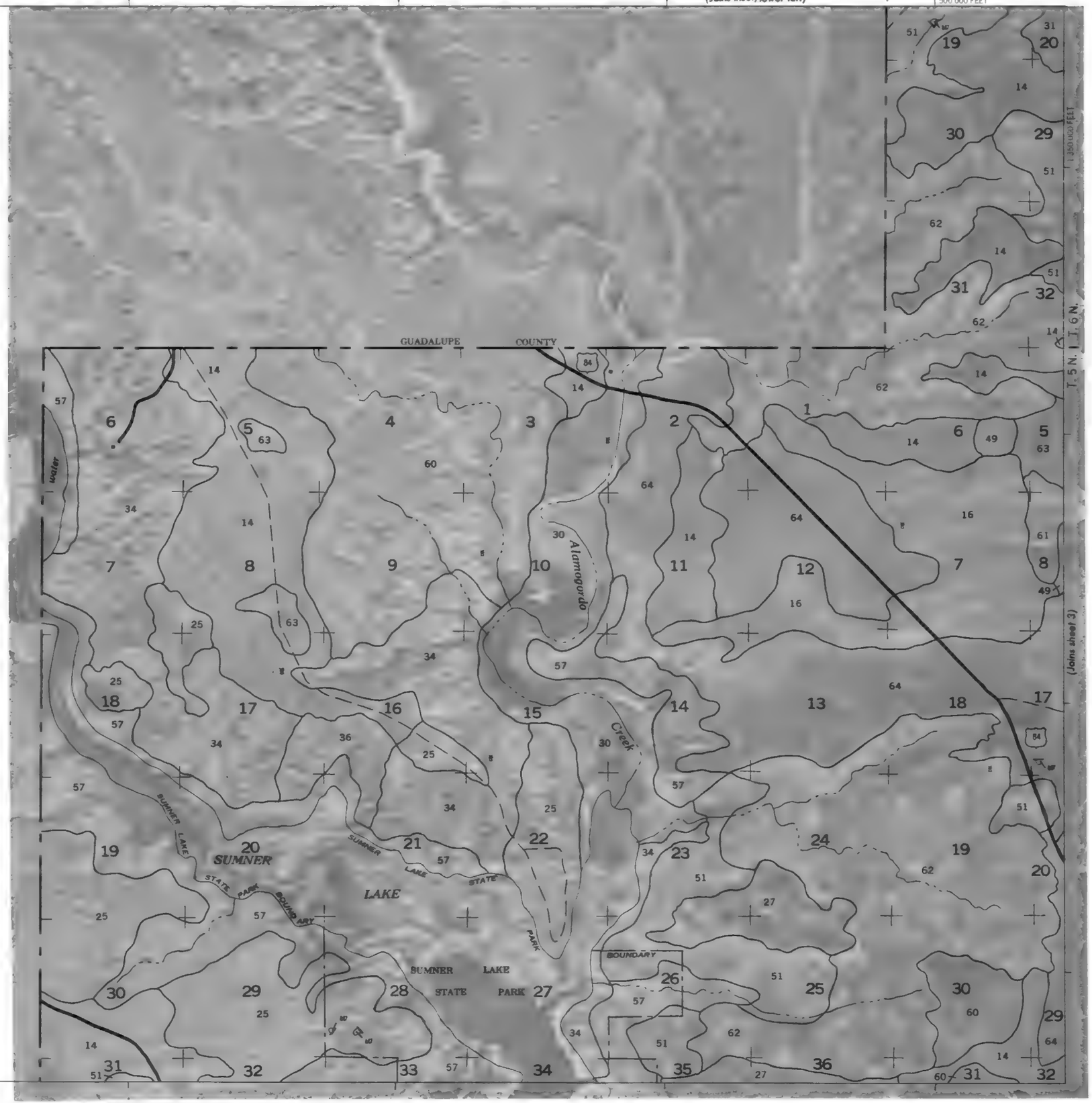
7 KILOMETERS

SCALE 1:48 000

INSET A



4000 AND 10000-FOOT GRID TICKS



1 320 000 FEET

450 000 FEET

(Joins sheet 6)

SOIL SURVEY OF DE BACA COUNTY, NEW MEXICO — SHEET NUMBER 3

R. 25 E. | R. 26 E.

510 000 FEET

1 320 000 FEET

T. 5 N. | T. 6 N.

(Joins sheet 1)

(Joins sheet 2)

(Joins sheet 33 — 1:15840)

(Joins sheet 7)

660 000 FEET

Arroyo del Anil

LOW INTENSITY AREA

HIGH INTENSITY AREA

COUNTY

QUAY

3

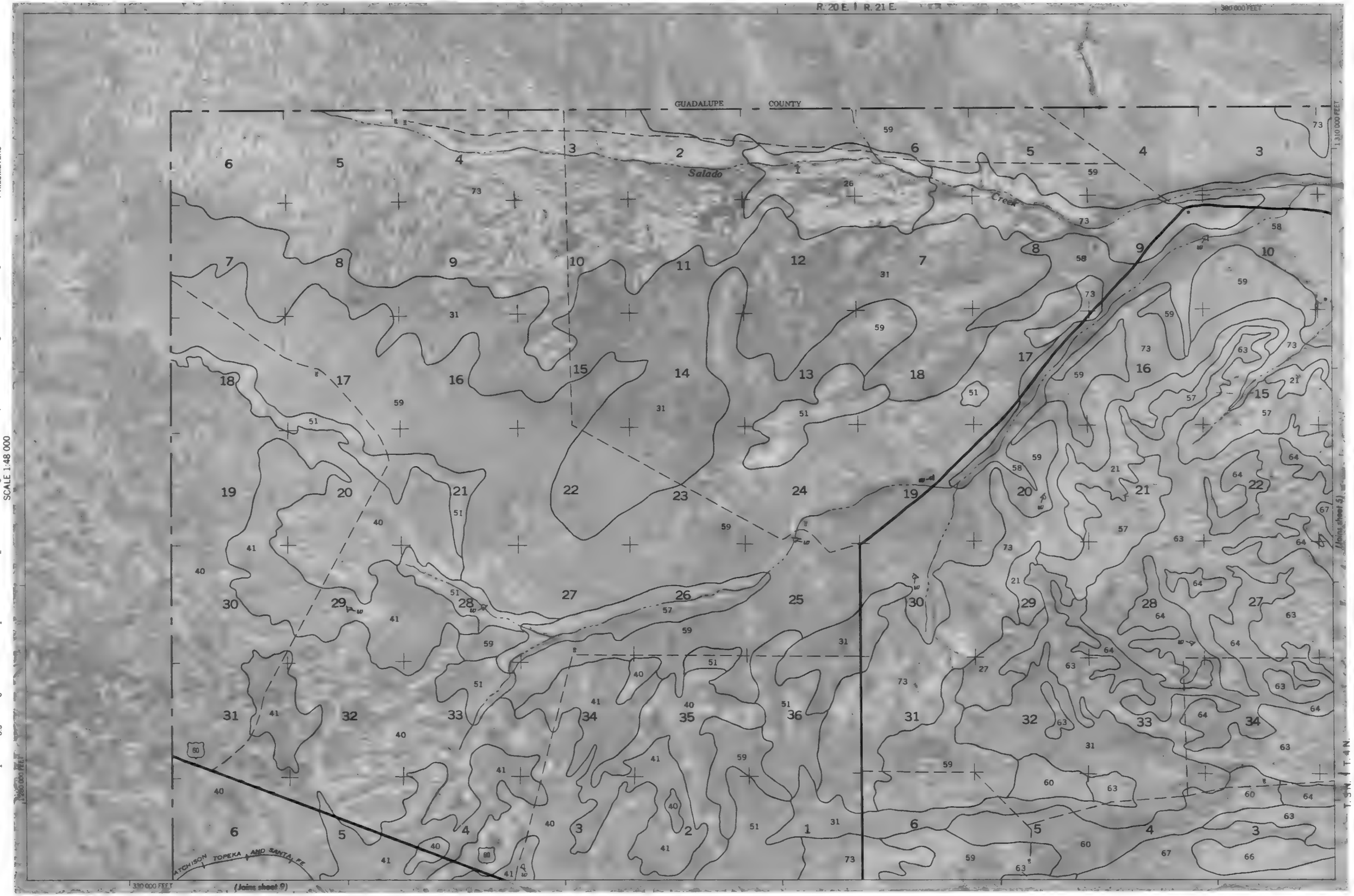
N

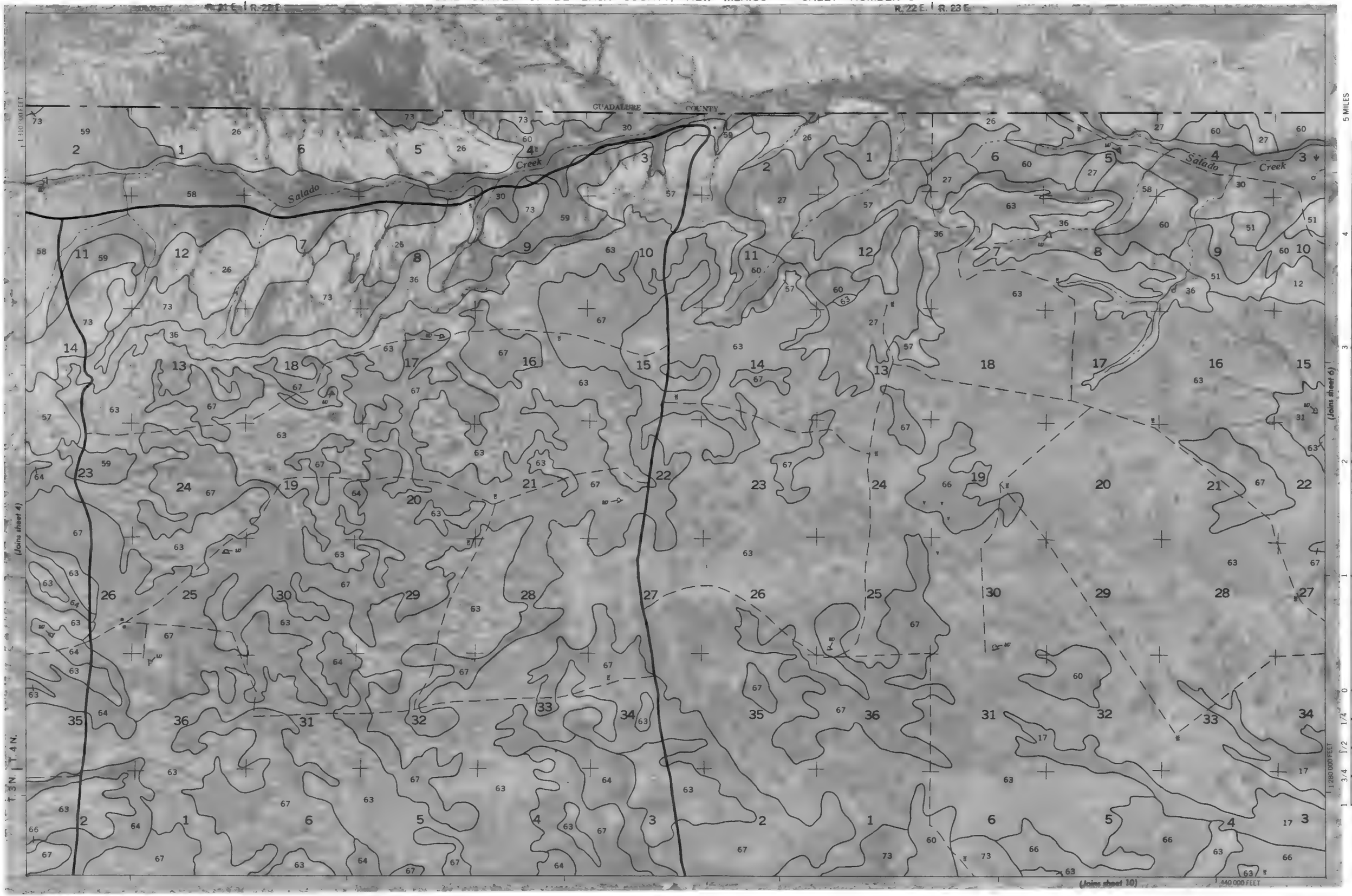
5 MILES

7 KILOMETERS

SCALE 1:48 000

SOIL SURVEY OF DE BACA COUNTY, NEW MEXICO — SHEET NUMBER 4




R. 21 E.
R. 22 E.
R. 23 E.
GUADALUPE COUNTY
Salado Creek
T. 3 N.
T. 4 N.
(Joins sheet 4)
(Joins sheet 6)
(Joins sheet 10)
1 310 000 FEET
440 000 FEET
5 MILES
7 KILOMETERS
SCALE 1:48 000
N

(6)

(Joins sheet 2) R. 23 E. | R. 24 E. R. 24 E. | R. 25 E.

T. 4 N. | T. 5 N.

GUADALUPE COUNTY

Salado Creek

SUMNER LAKE STATE PARK

SUMNER LAKE

ALAMOGORDO DAM

LAKE SUMNER

STATE PARK BOUNDARY

PECOS RIVER

T. 3 N. | T. 4 N.

(Joins sheet 5)

(Joins sheet 7)

(Joins sheet 11)

1 450 000 FEET

1 280 000 FEET

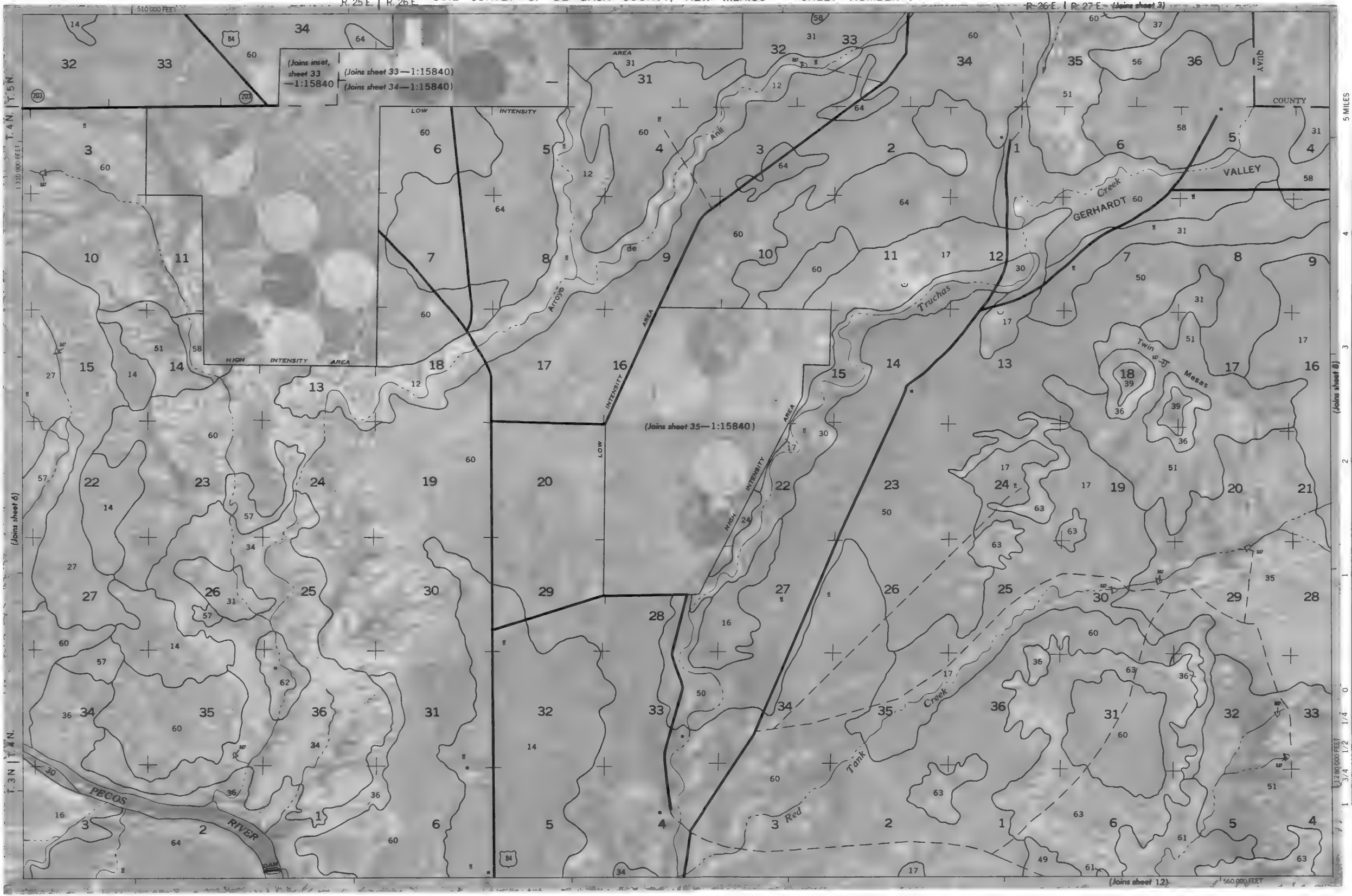
SCALE 1:48 000

5 MILES 4 3 2 1 0

7 KILOMETERS 6 5 4 3 2 1 0

N

SOIL SURVEY OF DE BACA COUNTY, NEW MEXICO — SHEET NUMBER 7



(8)

R. 27 E. | R. 28 E.

N

5 MILES

7 KILOMETERS

SCALE 1:48 000

1 280 000 FEET

570 000 FEET

(Joins sheet 13)

(Joins sheet 7)

QUAY COUNTY

ROOSEVELT COUNTY

T. 3 N. | T. 4 N.

GERHARDT VALLEY

Charlotte Point

AIRPORT

Red Tank Creek

Candy Mesa

TAIBAN MESA

SOIL SURVEY OF DE BACA COUNTY, NEW MEXICO — SHEET NUMBER 9

9

N

R. 20 E. | R. 21 E.

(Joins sheet 4)

330 000 FEET

1 270 000 FEET

T. 2 N. | T. 3 N.

GUADALUPE COUNTY

ATCHISON TOPEKA AND SANTA FE

(Joins sheet 10)

(Joins sheet 14)

1 380 000 FEET

1 240 000 FEET

5 MILES

7 KILOMETERS

SCALE 1:48 000

(10)

N

R. 21 E. | R. 22 E. | R. 22 E. | R. 23 E.

(Joins sheet 5)

(Joins sheet 9)

(Joins sheet 11)

(Joins sheet 15)

T. 2 N. | T. 3 N.

ATCHISON TOPEKA AND SANTA FE

Yeso

5 MILES 7 KILOMETERS

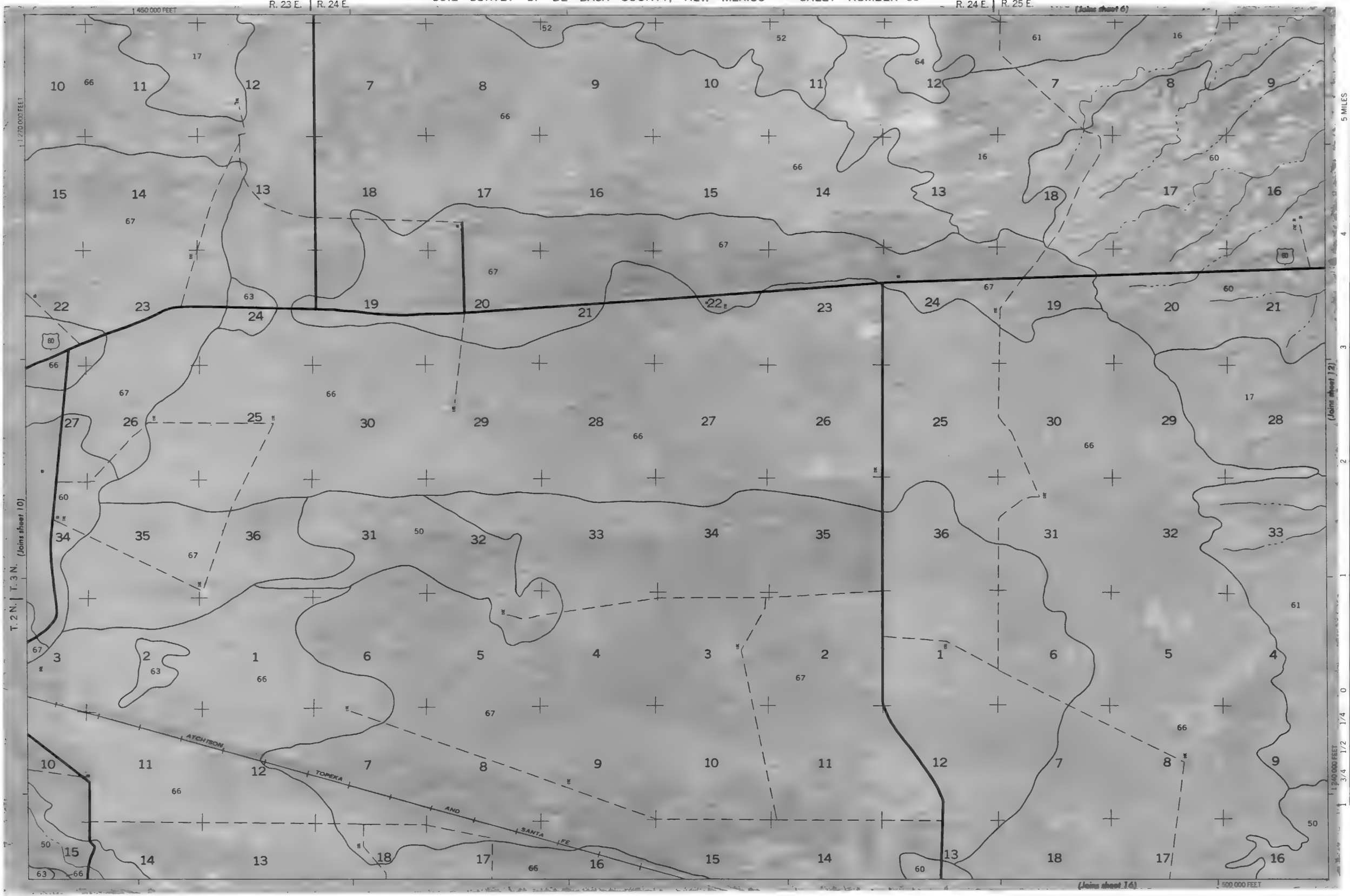
SCALE 1:48 000

1 240 000 FEET

390 000 FEET

1 270 000 FEET

SOIL SURVEY OF DE BACA COUNTY, NEW MEXICO — SHEET NUMBER 11



12

N

R. 25 E. | R. 26 E.

R. 26 E. | R. 27 E.

(Joins sheet 7)

PECOS RIVER

Truchas Creek

HIGH INTENSITY AREA

(Joins sheet 36 —1:15840)

(Joins sheet 37—1:15840)

ATCHISON TOPEKA AND SANTA FE

LOW INTENSITY

(Joins sheet 37—1:15840)

(Joins sheet 38 —1:15840)

AREA

INTENSITY

(Joins sheet 38 —1:15840

HIGH INTENSITY

LOW AREA

(Joins sheet 17)

(Joins sheet 13)

T. 2 N. | T. 3 N.

5 MILES

7 KILOMETERS

SCALE 1:48 000

1 240 000 FEET

510 000 FEET

1 970 000 FEET

R. 27 E. | R. 28 E.

570 000 FEET

1 270 000 FEET

T. 2 N. | T. 3 N.

(Joins sheet 12)

TAIBAN MESA

Red Lake

Taiban Creek

Taiban

ATCHISON TOPEKA AND SANTA FE

ROOSEVELT COUNTY

(Joins sheet 35—1:15840)

HIGH INTENSITY AREA

LOW INTENSITY AREA

(Joins sheet 101)

620 000 FEET

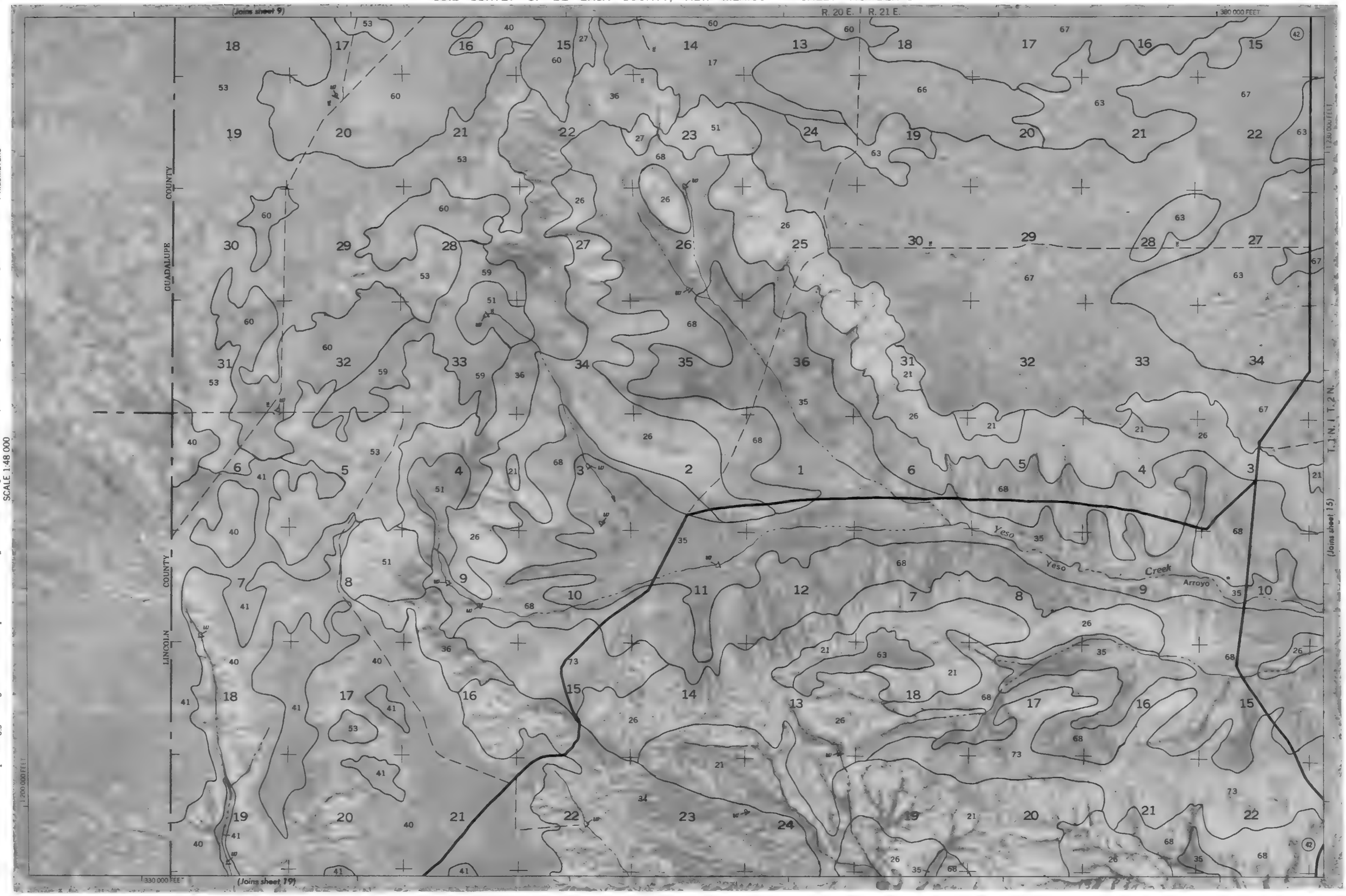
N

5 MILES

7 KILOMETERS

1 240 000 FEET

SCALE 1:48 000


(14)
N
5 MILES
7 KILOMETERS
SCALE 1:48 000
1 200 000 FEET
(Joins sheet 9)
R. 20 E.
R. 21 E.
380 000 FEET
T. 1 N.
T. 2 N.
(Joins sheet 15)
GUADALUPE COUNTY
LINCOLN COUNTY
Yeso Creek
Yeso Arroyo
330 000 FEET
(Joins sheet 19)
(42)

390 000 FEET

R. 21 E. | R. 22 E. | R. 23 E.

1 230 000 FEET

T. 1 N. | T. 2 N.

(Joins sheet 14)

(Joins sheet 10)

(Joins sheet 16)

(Joins sheet 20)

440 000 FEET

Yeso Creek

Arroyo

MESA EL MORRO

CONEJO MESA

15

N

5 MILES

7 KILOMETERS

SCALE 1:48 000

1 200 000 FEET

16

N

5 MILES

7 KILOMETERS

SCALE 1:48 000

(Joins sheet 11)

R. 23 E. | R. 24 E.

R. 24 E. | R. 25 E.

500 000 FEET

1 230 000 FEET

T. 1 N. | T. 2 N.

(Joins sheet 17)

(Joins sheet 15)

1 200 000 FEET

(Joins sheet 21)

1 450 000 FEET

ATCHISON TOPEKA AND SANTA FE

Yeso Arroyo Creek

SOIL SURVEY OF DE BACA COUNTY, NEW MEXICO — SHEET NUMBER 17

(18)

R. 27 E. | R. 28 E.

(Joins sheet T3)

620 000 FEET

T. 1 N. | T. 2 N.

COUNTY

ROOSEVELT

(Joins sheet 17)

(Joins sheet 23)

570 000 FEET

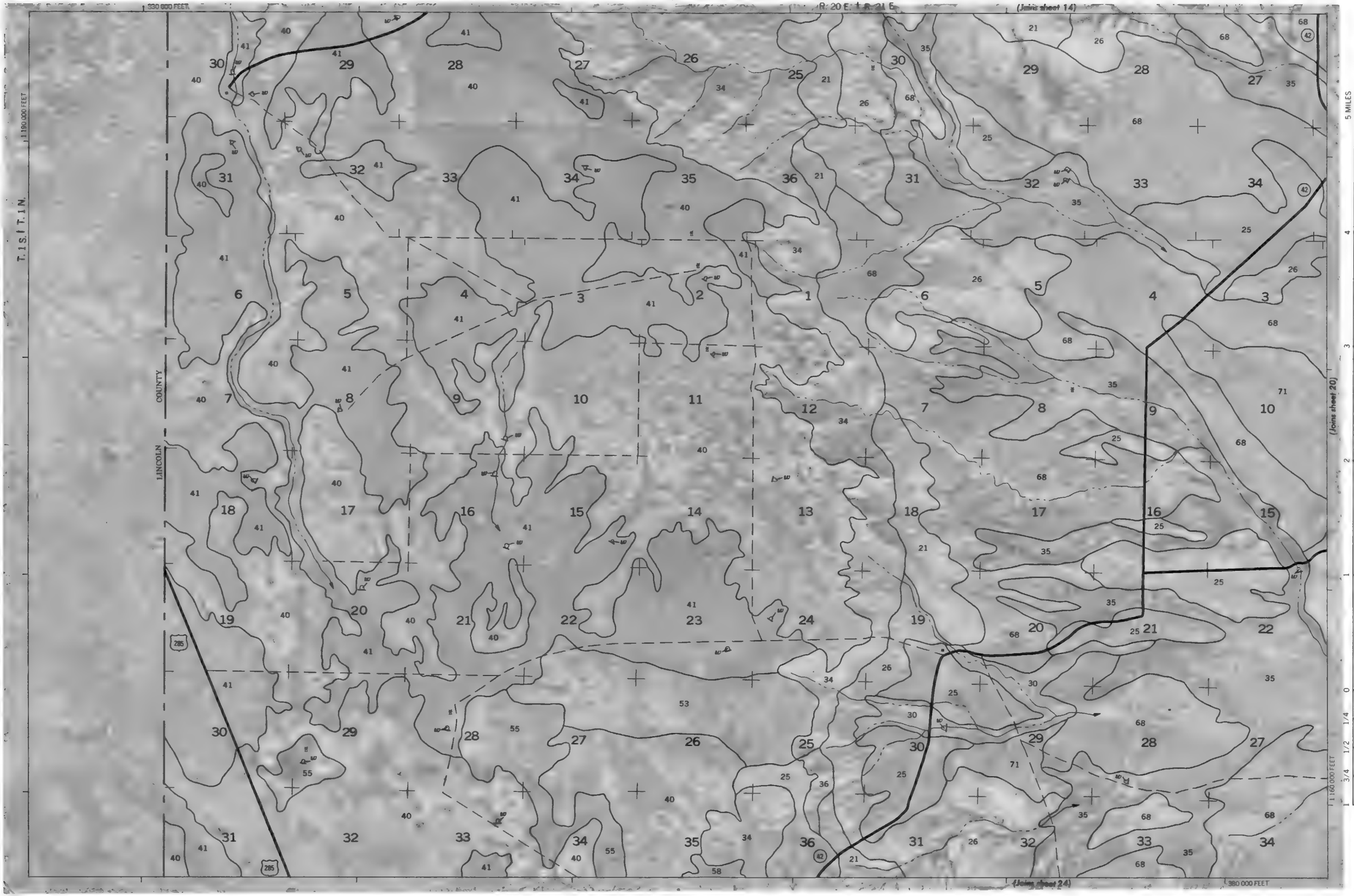
1 200 000 FEET

SCALE 1:48 000

5 MILES

7 KILOMETERS

SOIL SURVEY OF DE BACA COUNTY, NEW MEXICO — SHEET NUMBER 19



20

N

(Joins sheet 15)

395000 FEET

R. 21 E. | R. 22 E.

R. 22 E. | R. 23 E.

CONEJO MESA

Gillespie Draw

Whites Draw

int

T. 1 S. | T. 1 N.

(Joins sheet 19)

(Joins sheet 21)

(Joins sheet 25)

440 000 FEET

SCALE 1:48 000

5 MILES 4 3 2 1 0

7 KILOMETERS 6 5 4 3 2 1 0

1 3/4 1/2 1/4 0 1 0.5 0

SOIL SURVEY OF DE BACA COUNTY, NEW MEXICO — SHEET NUMBER 21

R. 23 E. | R. 24 E. | R. 24 E. | R. 25 E.

450 000 FEET

1 190 000 FEET

T. 1 S. | T. 1 N.

MESA

CONEJO

Yeso Creek

Gillespie Draw

Alamo Draw

Conejo Creek

(Joins sheet 20)

(Joins sheet 22)

(Joins sheet 26)

1 500 000 FEET

1 160 000 FEET

21

N

5 MILES

7 KILOMETERS

SCALE 1:48 000

N

R. 25 E. | R. 26 E.

R. 26 E. | R. 27 E.

(Joins sheet 17)

(Joins inset 8, sheet 39 —1:15840)

HIGH INTENSITY AREA

LOW INTENSITY AREA

Yeso Creek

RIVER

Cibola

Bonnie Lake

Cañon Blanco

PECOS

Alamo Drew

Eighteen Mile Drew

Creek

(Joins sheet 21)

(Joins sheet 23)

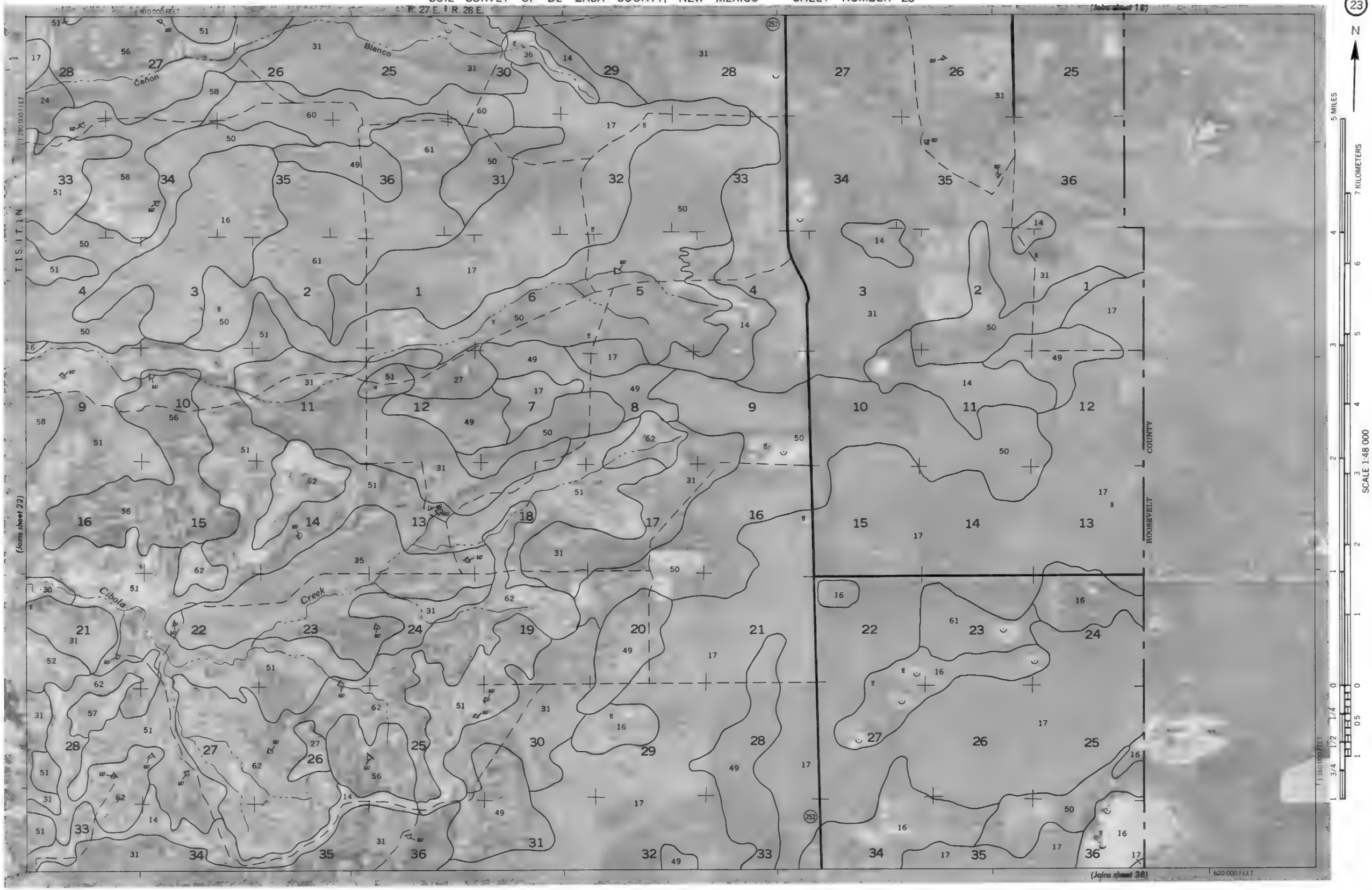
(Joins sheet 27)

T. 1 S.

T. 2 S.

5 MILES 7 KILOMETERS

SCALE 1:48 000


R. 27 E.
R. 28 E.
T. 1 S.
T. 1 N.
Blanco Canon
Cibola Creek
ROOSEVELT COUNTY
(Joins sheet 22)
(Joins sheet 28)
620 000 FEET
1 160 000 FEET
5 MILES
7 KILOMETERS
SCALE 1:48 000
N
23

SOIL SURVEY OF DE BACA COUNTY, NEW MEXICO — SHEET NUMBER 24

N

SCALE 1:48 000

5 MILES 4 3 2 1 0

7 KILOMETERS 6 5 4 3 2 1 0

1 3/4 1/2 1/4 0 0.5 1

1 120 000 FEET

R. 20 E. | R. 21 E.

T. 2 S. | T. 1 S.

T. 3 S. | T. 2 S.

330 000 FEET

350 000 FEET

(Joins sheet 19)

(Joins sheet 25)

(Joins sheet 29)

LINCOLN COUNTY

CHAVES COUNTY

Automobile Draw

Draw

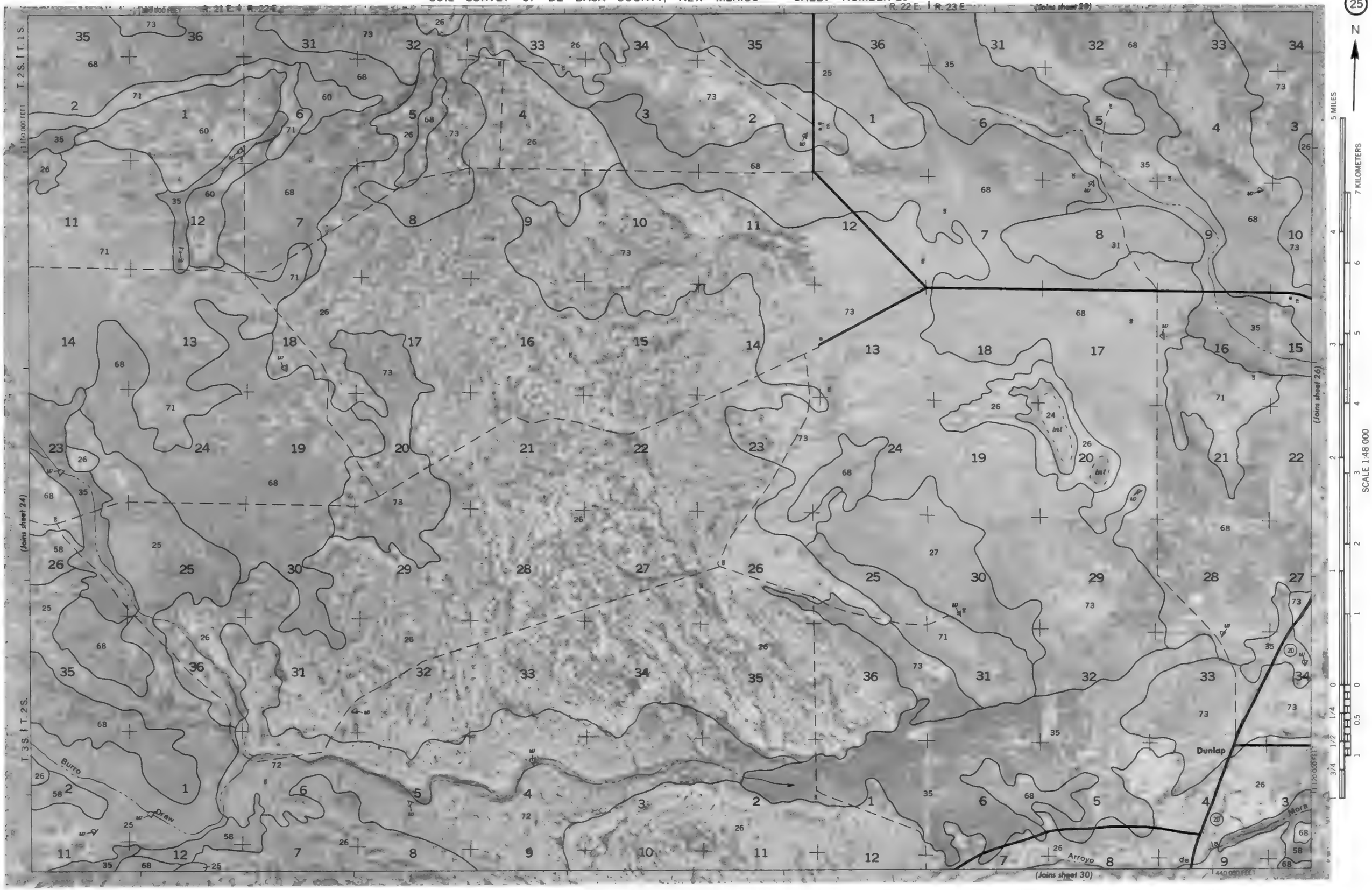
Burro

int

285

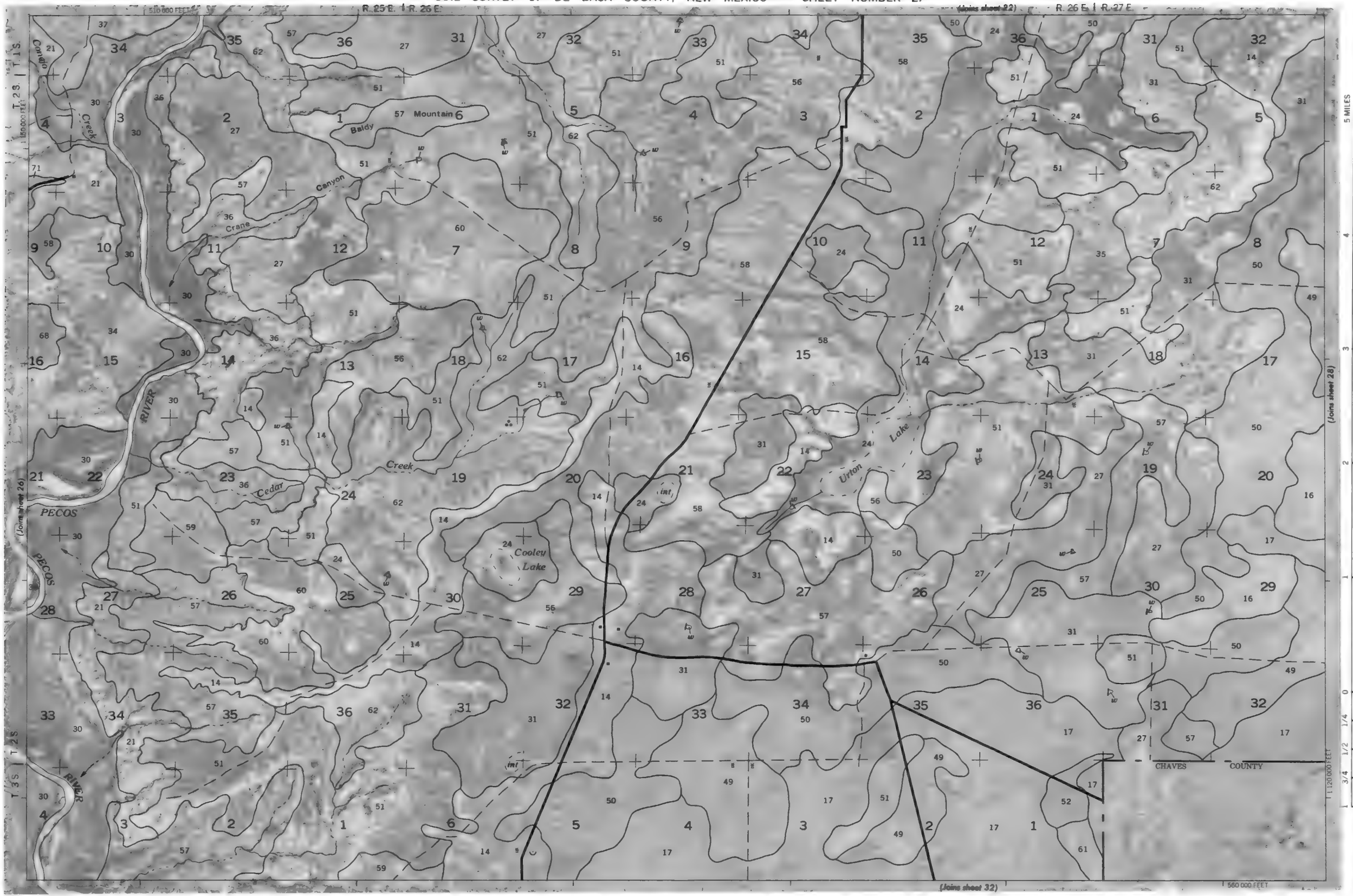
42

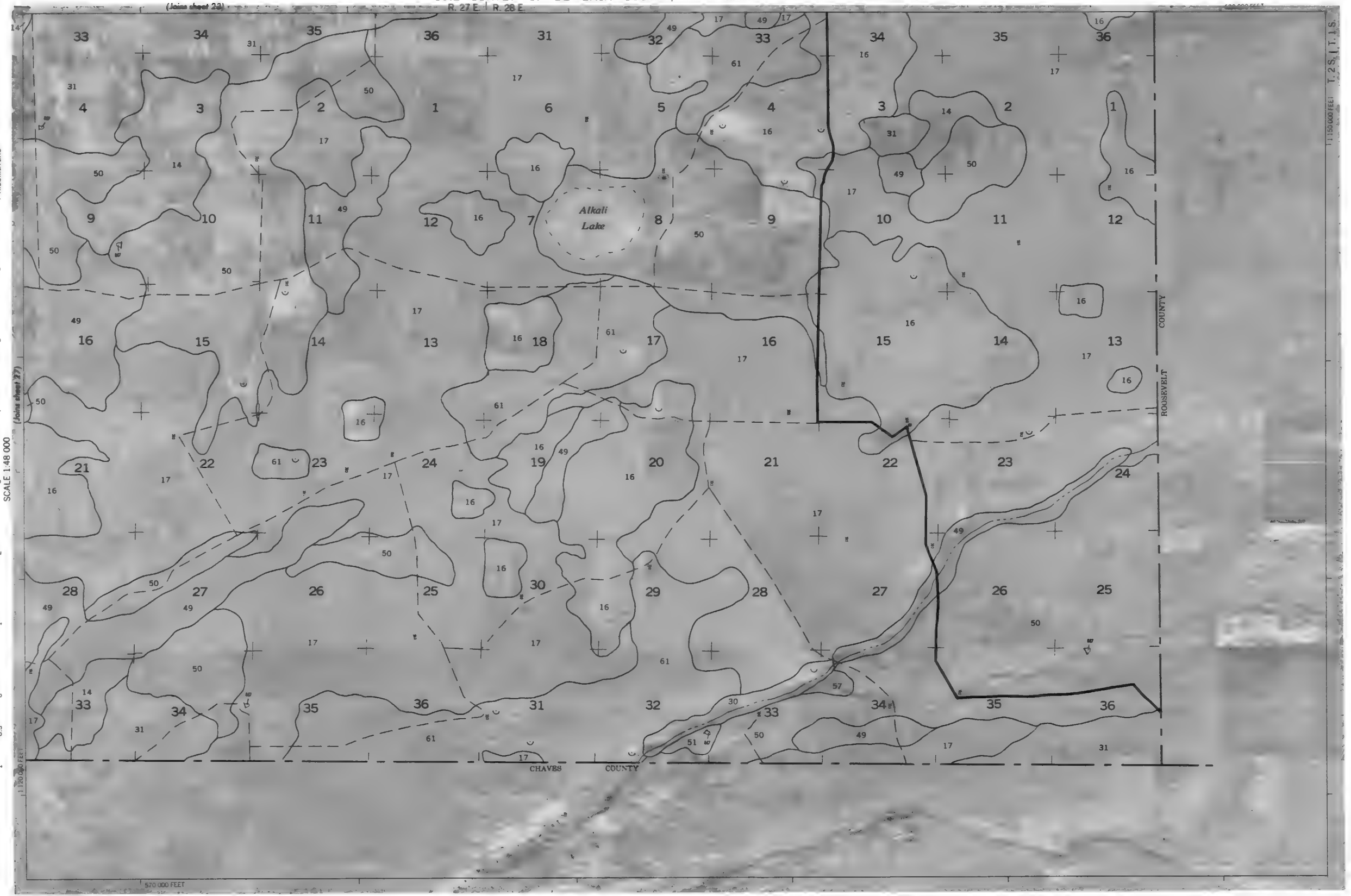
SOIL SURVEY OF DE BACA COUNTY, NEW MEXICO — SHEET NUMBER 25

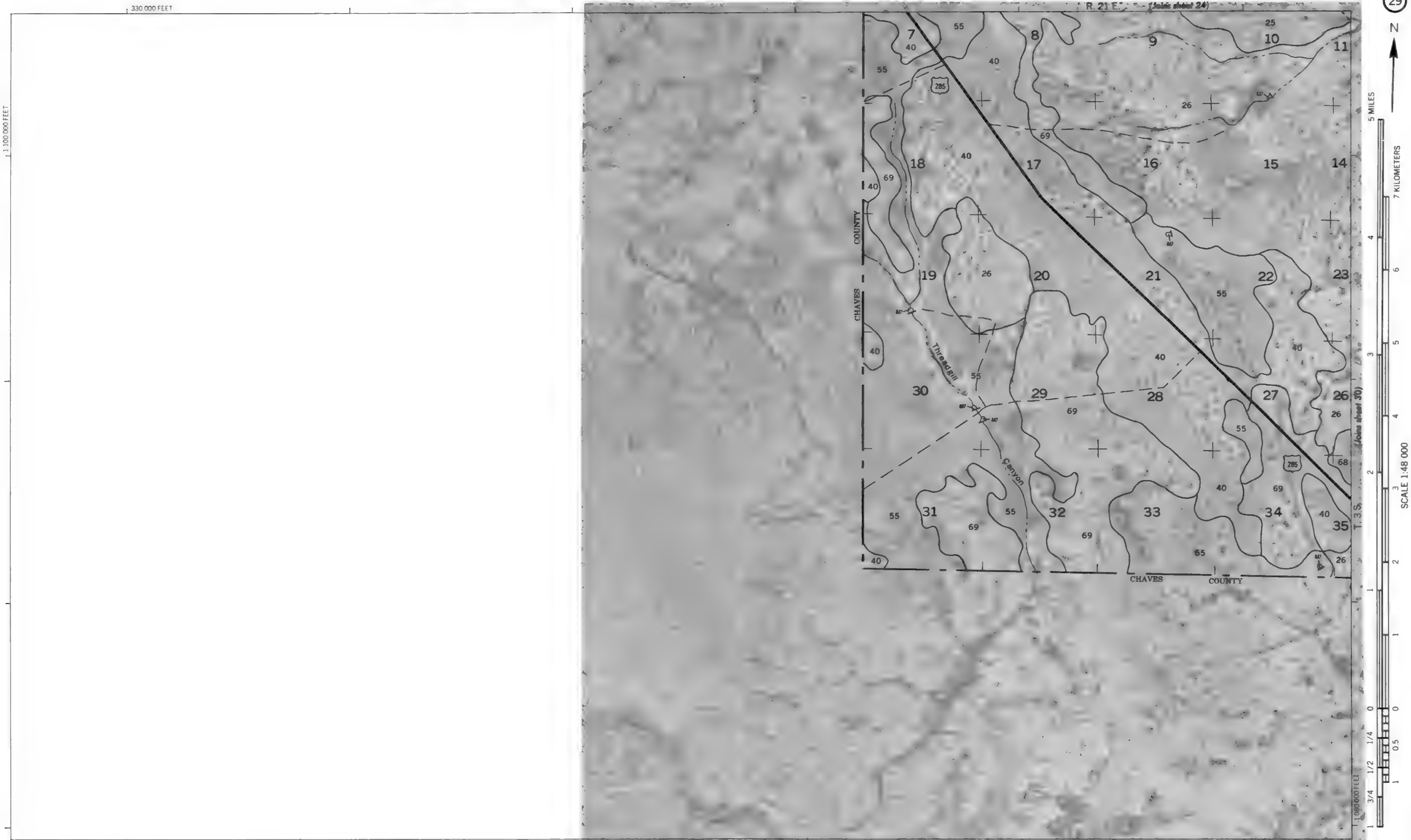



(26)
N
5 MILES
7 KILOMETERS
SCALE 1:48 000
1 3/4 1/2 1 0 0 1/4 0.5 1
1 2 3 4 5 6
(Joins sheet 21)
R. 23 E.
R. 24 E.
R. 24 E.
R. 25 E.
500 000 FEET
T. 11 S.
T. 12 S.
T. 13 S.
(Joins sheet 25)
(Joins sheet 27)
(Joins sheet 31)
450 000 FEET
Gillespie
Draw
Draw
Loveady
Arroyo de la Mora
Blanco Canyon
Wildcat Canyon
PECOS RIVER

SOIL SURVEY OF DE BACA COUNTY, NEW MEXICO — SHEET NUMBER 27




(Joins sheet 23)
R. 27 E.
R. 28 E.
T. 2 S.
T. 1 S.
Alkali Lake
ROOSEVELT COUNTY
CHAVES COUNTY
(Joins sheet 27)
N
SCALE 1:48 000
5 MILES
7 KILOMETERS
1 INCH = 0.5 MILES
1 CENTIMETER = 0.5 KILOMETERS
1 150 000 FEET
570 000 FEET


29
N
330 000 FEET
1 100 000 FEET
1 080 000 FEET
R. 21 E.
(Joins sheet 24)
(Joins sheet 30)
T. 3 S.
CHAVES COUNTY
CHAVES COUNTY
Threadgill Canyon
285
5 MILES
7 KILOMETERS
SCALE 1:48 000


30
N
(Joins sheet 25)
R. 21 E.
R. 22 E.
R. 22 E.
R. 23 E.
(448 000 FEET)
Arroyo
Mora
Wylie
Draw
CHAVES
COUNTY
T. 3 S.
(Joins sheet 29)
(Joins sheet 31)
SCALE 1:48 000
5 MILES
7 KILOMETERS
1 080 000 FEET
390 000 FEET

R. 23 E. | R. 24 E. | R. 24 E. | R. 25 E.

(Joins sheet 20)

(Joins sheet 30)

T. 3 S.

Arroyo de la Mora

Arroyo

Araña

Wylie Draw

Wylie Draw

CHAVES COUNTY

31

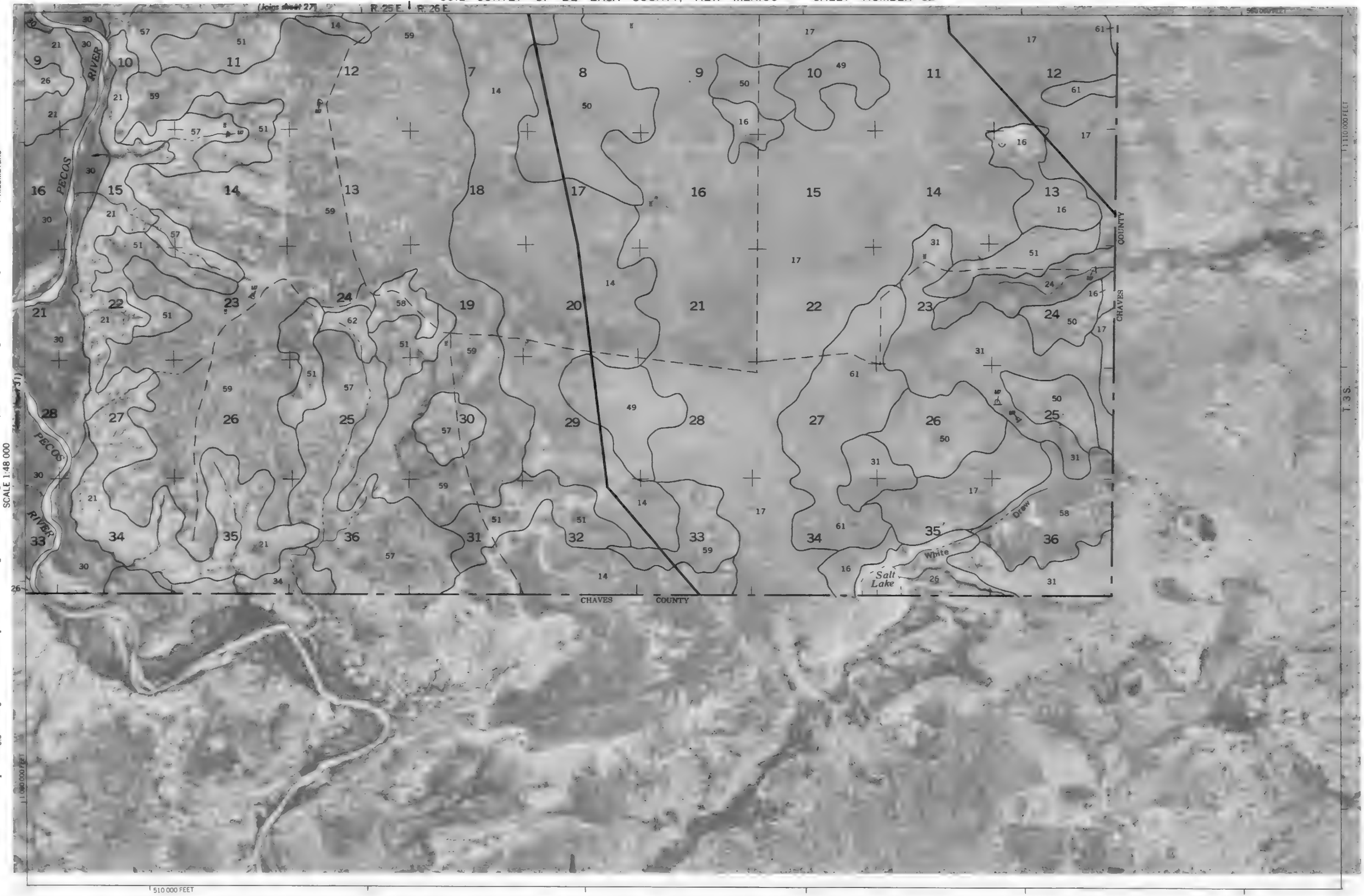
N

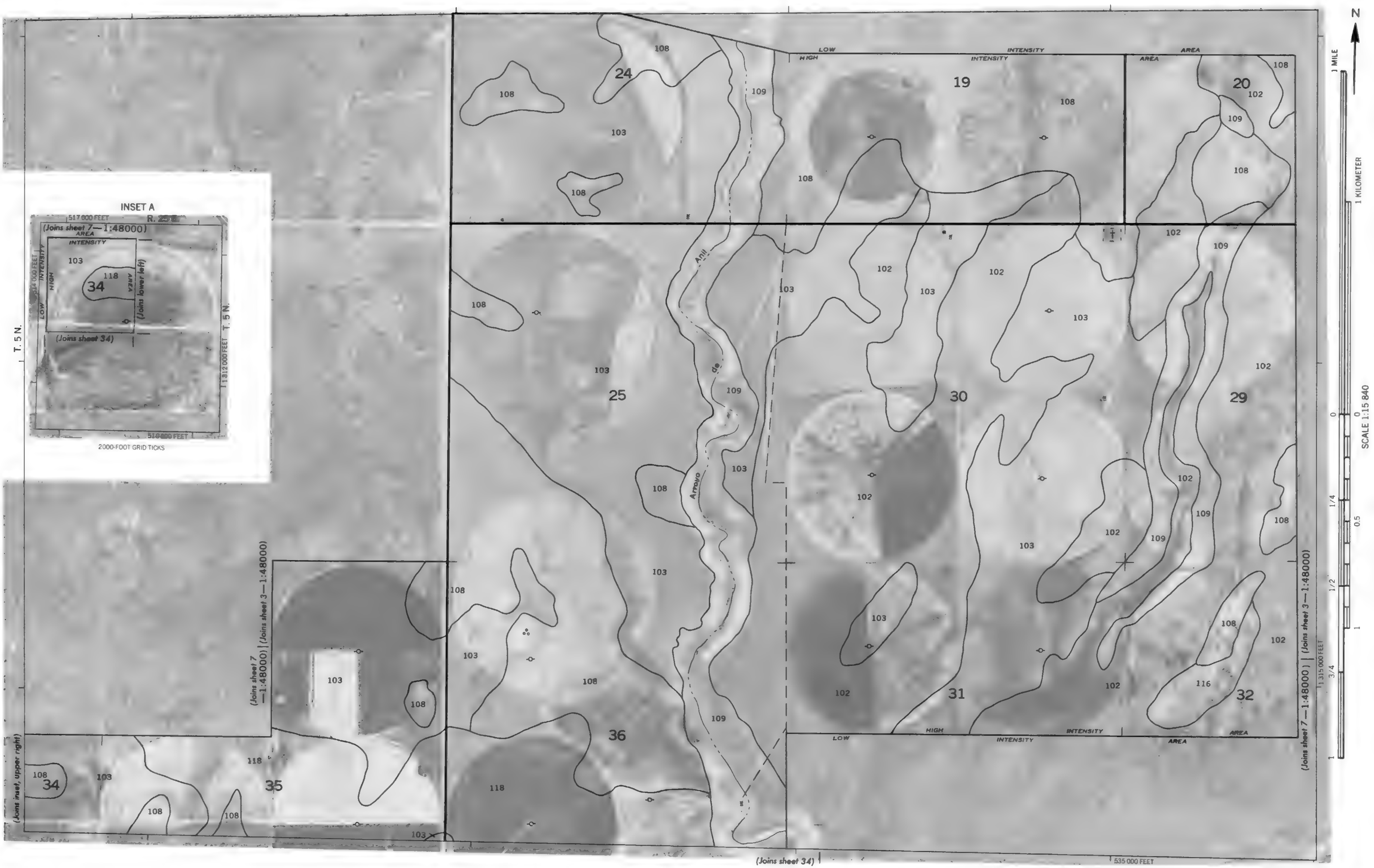
5 MILES

7 KILOMETERS

SCALE 1:48 000

500 000 FEET


(Joins sheet 27)
R. 25 E.
R. 26 E.
PECOS RIVER
PECOS RIVER
White Draw
Salt Lake
CHAVES COUNTY
CHAVES COUNTY
T. 3 S.
N
5 MILES
7 KILOMETERS
SCALE 1:48 000
510 000 FEET
1 110 000 FEET


R. 25 E. | R. 26 E.
33
N
T. 5 N.
INSET A
LOW INTENSITY AREA
HIGH INTENSITY AREA
Arroyo de Anil
(Joins sheet 34)
(Joins sheet 7—1:48000)
(Joins sheet 3—1:48000)
(Joins inset, upper right)
2000-FOOT GRID TICKS
535 000 FEET
1 MILE
1 KILOMETER
SCALE 1:15 840
0
1/4
1/2
3/4
1
0.5

(34)

N

1 MILE

1 KILOMETER

SCALE 1:15 840

0 1/4 0.5 1/2 1 3/4 1

(Joins sheet 33)

(Joins sheet 33)

R. 25 E.

530 000 FEET

T. 4 N. | T. 5 N.

11 310 000 FEET

(Joins sheet 7 —1:48000)

(Joins sheet 7—1:48000)

(Joins sheet 7—1:48000)

(Joins sheet 7—1:48000)

34

35

36

1

2

11

12

13

14

102

103

108

109

116

118

203

84

INTENSITY

HIGH

LOW

AREA

1 300 000 FEET

515 000 FEET

535 000 FEET

R. 26 E.

1 300 000 FEET

T. 4 N.

T. 2 N.

1 250 000 FEET

610 000 FEET

R. 28 E.

1 248 000 FEET

615 000 FEET

550 000 FEET

1 290 000 FEET

(Joins sheet 7—1:48000)

(Joins sheet 13—1:48000)

INSET A

HIGH INTENSITY AREA

LOW INTENSITY AREA

ROOSEVELT COUNTY

16 15 21 22 28 27 2 1

102 103 105 108 109 113 114 116 117 118 51

35

N

1 MILE

1 KILOMETER

SCALE 1:15 840

0 1/4 1/2 3/4 1

0 0 5 1


36
N
1 MILE
1 KILOMETER
SCALE 1:15 840
R. 25 E. | R. 26 E.
540 000 FEET
1 270 000 FEET
T. 3 N.
1 260 000 FEET
1 525 000 FEET
(Joins sheet 12—1:48000)
(Joins sheet 12—1:48000)
(Joins inset sheet 37) | (Joins sheet 37)
LOW HIGH INTENSITY INTENSITY AREA AREA
LOW INTENSITY AREA
FORT SUMNER AIRPORT
SANITARY LAND FILL
Truchas Creek
PECOS RIVER
FORT SUMNER
ATCHISON TOPEKA AND SANTA FE
FORT SUMNER MAIN CANAL
9
10
13
15
16
17
18
19
20
21
22
24
102
103
107
108
118
37
34
30
113
112
111
105
106
115
27

INSET A

2000-FOOT GRID TICKS

37

N

1 MILE

1 KILOMETER

SCALE 1:15 840

1 250 000 FEET

38

N

1 MILE

1 KILOMETER

SCALE 1:15 840

0 0.5 1

1/4 1/2 3/4 1

(Joins sheet 37)

R. 26 E.

598 000 FEET

1 245 000 FEET

T. 2 N.

1 338 000 FEET

535 000 FEET

(Joins sheet 40)

(Joins sheet 12—1:48000)

(Joins sheet 17—1:48000)

(Joins sheet 12—1:48000)

(Joins sheet 17—1:48000)

(Joins sheet 12—1:48000)

(Joins sheet 17—1:48000)

LOW INTENSITY AREA

HIGH INTENSITY AREA

PECOS RIVER

UPPER DRAIN

LOWER DRAIN

SUMNER MAIN CANAL

FORT SUMNER IRRIGATION DISTRICT

HIGH LINE CANAL

HIGH LOW INTENSITY AREA

4 3 2 1

9 10 11 12

15 14 22 23

water

30 105 106 107 110 111 112 113 114 115 117 102 103 212 272

R. 26 E.

INSET A

R. 26 E.

532 000 FEET

1 207 000 FEET

T. 1 N.

(Joins sheet 17—1:48000)

109 118 103 16 int 118 102 103 102 118 116 37 103 102

HIGH LOW INTENSITY INTENSITY AREA AREA

4000 AND 5000-FOOT GRID TICKS

537 000 FEET

1 203 000 FEET

INSET B

R. 26 E.

532 000 FEET

(Joins sheet 17—1:48000)

1 950 000 FEET

T. 1 N.

102 37 62 103 118 28 37 103 118 117 118

HIGH LOW INTENSITY INTENSITY AREA AREA

(Joins sheet 22—1:48000)

4000 AND 5000-FOOT GRID TICKS

537 000 FEET

1 946 000 FEET

(Joins sheet 17—1:48000)

LOW HIGH INTENSITY INTENSITY AREA AREA

118 102 103 int 103 29 103 117 102 103 108 103 109 118 117 108 103

28 102 117 116 102 103 118

LOW INTENSITY AREA

(Joins sheet 17—1:48000)

1 230 000 FEET

535 000 FEET

T. 2 N.

1 220 000 FEET

39

N

1 MILE

1 KILOMETER

SCALE 1:15 840

0 1/4 0.5 1/2 1 3/4 1

(40)

N

1 MILE

1 KILOMETER

SCALE 1:15 840

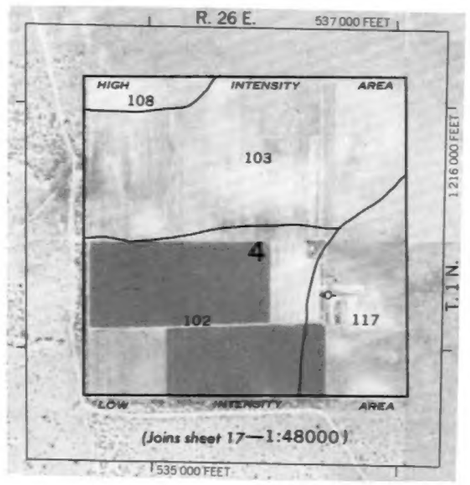
0 0 1/4 0.5 1/2 1 3/4 1

1 220 000 FEET

535 000 FEET

(Joins sheet 38)

INSET A



2000-FOOT GRID TICKS

INSET B

2000 AND 4000-FOOT GRID TICKS